Volume 94 Number 18

STEEL

Production • Processing • Distribution • Use

The Week in Perspective

"SELLING TRANSPORTATION," as General Johnson puts it, by means of the present basing-point system on steel prices probably will be eliminated as a result of the meeting between NRA officials and the steel code authority last week. Other revisions in the steel code appear likely. p. 10

DEFICITS still rule the balance sheets, according to early first-quarter financial analyses of steel companies. Indicated loss for the industry was below $10,000,000, which is decided improvement. p. 10

STEEL PRODUCTION last week neared the 1933 peak level—57 per cent, up 2 points from the week previous. A new depression-high would not be surprising this week. p. 12

CONTRACTORS handling government jobs are having a difficult time of it, with treasury and navy restrictions on profits and an army ban on lobbying. p. 16

STRIKE-MINDED tool and die workers may find themselves with no jobs to walk out on if automobile manufacturers go through with a rumored plan of making no further changes in dies for 1935 models. p. 18

HEAVY GALVANIZED STEEL PLATES are to be used for the first time in hull construction, on four new coast guard vessels. p. 15

TWO PROMINENT FOUNDRYMEN, both pioneers, have died within the past ten days—Walter D. Wood and Samuel T. Johnston. p. 19

PROBLEM OF CAPITAL GOODS industries is one uppermost in the new deal. Congress has been charged with laxity in handling it; but the administration, by its continual vacillation, has aided the cause little. p. 20

GRAIN SIZE is a subject in which steelmakers are currently showing intense interest, principally because it is intimately associated with the hardenability of steel. Control rests with physical chemists and open-hearth melters. p. 44

ELECTRIC SIGNS grow bigger and better. A new giant "spectacular" being erected in Chicago embodies over 360 tons of steel—structurals and sheets. p. 27

WELDING AND STEEL FOUNDING are two branches of industry that should be considered complementary and not antagonistic. Technologists in the two fields can co-operate to their mutual advantage. p. 30

MARCH EXPORTS of iron and steel kept in step with other business and reached a new high since July, 1929. Bulk of this rise was accounted for by scrap shipments. p. 14

CADMIUM PLATING depends upon thickness for effectiveness. For exposure to indoor corrosion, a minimum of 0.0002-inch suffices; for the more severe outdoor corrosion, a minimum of 0.0004-inch. A test has been perfected recently to determine chemically the thickness of plated cadmium. p. 23

ROLLING OF STEEL SHEETS has progressed steadily from the original hand mill to the modern 4-high continuous mill, aim constantly being to satisfy demand and to reduce cost of conversion from ingot to sheet. Further refinement of the continuous process is visioned. p. 34

FOLDING CHAIRS are now being made entirely of steel, high in strength and low in weight. p. 29

RAZOR BLADES require heat treatment for satisfactory service and to this end has been the development of an electric hardening and tempering furnace handling 100,000 blades daily. p. 26

Institute Names Committee To Consider Changes in Code

CHANGES in the NRA steel code, probably effective when it is extended beyond May 31, will be considered by a small committee representing the American Iron and Steel institute and government representatives.

This decision was reached Friday at a meeting of directors of the institute in New York with Donald Richberg, general counsel for NRA, and Division Administrator K. M. Simpson.

No definite proposals for revising the code were submitted by Messrs. Richberg and Simpson at the Friday meeting. NRA Administrator Johnson was absent, although he had been scheduled to attend.

In Washington, Thursday, General Johnson indicated that a revision which would quell recent criticism of the steel code would be easily reached. He intimated that certain producing districts would be made basing points in order to eliminate the charge that the steel industry "is selling transportation."

Elimination of the waiting period between the time of filing prices and making them effective also is under consideration. However, it is regarded as certain that prices will continue to be made public whether filed with the code authority, NRA, or any other designated body.

Following Friday's meeting Mr. Richberg said: "There is no question whatever of the maintenance of a great many benefits under the code from the standpoint of employment and wages, and of elimination of many unfair practices in the industry. There have been benefits on both sides. It is just a question of seeing the whole result. It takes time to organize code machinery and operations. We are now prepared to talk over the whole question of the future of the code."

Hearings of the steel code authority before the national recovery board of review in Washington occupied two days, and were then indefinitely postponed. Walter S. Tower, executive secretary of the institute, and Hoyt A. Moore, general counsel for the steel code authority, appeared on the stand in a proceeding that was hostile to the industry.

In congress, Rep. Ray P. Chase, of Minnesota, introduced a resolution demanding that the President exercise his authority and amend the steel code to prohibit further application of a Chicago base in the sales of steel from the Duluth mill to consumers in Minnesota.

Steel Cuts Losses To $1.34 per Ton

FIRST ten integrated steel producers to report for the first quarter disclosed improvement sufficient to indicate that the deficit for the entire industry in the quarter was below $10,000,000.

The actual deficit of the ten producers representing 84 per cent of capacity being $7,894,647, the indicated deficit for the entire industry is $9,398,389. On the basis of actual production of 7,007,660 tons of open-hearth and bessemer ingots during the quarter, the deficit per ton was only $1.34. For all 1933, the losses of the industry averaged $1.69 per ton.

Of the ten producers compared in the subjoined table, eight improved their position over the closing quarter of 1933. In both quarters four of the ten reported a profit.

United States Steel Corp.

A $10,000,000 improvement over a year ago is disclosed by the United States Steel Corp. financial report for the first quarter. A year ago the deficit was $16,730,271; in the fourth quarter it was $7,945,445; in the quarter just ended it was reduced to $6,989,965.

Prior to charges and allowances for depletion, depreciation and obsolescence and after ordinary repairs, maintenance and taxes, earnings from operations totaled $6,578,371. The net deficit of $6,989,965 does not include the 50-cent partial dividend again declared on the preferred stock, this increasing the drain on undivided surplus for the quarter to $8,791,370.

Shipments of finished products in the first quarter were 1,305,486 tons or 18 per cent less than in the final quarter of 1933. Operations during the quarter, based on production of finished products for sale, averaged 29 per cent, compared with 30.8 in the last quarter of 1933, and 15.8 in the first quarter of 1933.

Since April 1 the Corporation has averaged a 38 per cent operating rate, the finance committee stating "there are some indications that this rate will be continued and possibly exceeded during the second quarter."

The detailed statement follows:

Earnings for the quarter resulting from operations after deducting all expenses incident thereto, including ordinary repairs and maintenance of plants and taxes		$ 6,578,731
Charges and allowances for depletion, depreciation and obsolescence		10,795,225
Deficit		$ 4,216,494
Interest charges for the quarter:		
On bonds of subsidiary companies	$1,262,709	

Steel Deficits in First Quarter Are Lowest Since Recovery Set in Last Year

All Financial Statistics Are Deficits Except Where Asterisk Denotes a Profit

	First Quarter 1934	Fourth Quarter 1933	First Quarter 1933	Total 1933	Annual Ingot Capacity
United States Steel Corp.	$ 6,989,965	$ 7,945,445	$16,730,271	$36,020,097	27,630,000
Bethlehem Steel Corp.	902,044	629,671*	5,769,451	8,735,723	9,457,000
Republic Steel Corp.	58,682	1,268,472	2,521,569	4,049,253	4,848,000
Jones & Laughlin Steel Corp.	1,924,524	626,418	2,060,645	5,366,997	3,420,000
Youngstown Sheet & Tube Co.	1,423,468	1,484,363	3,473,370	8,342,901	3,240,000
National Steel Corp.	1,642,328*	242,530*	280,844*	2,812,406*	2,232,000
American Rolling Mill Co.	545,269*	360,831	966,596	673,089	2,200,000
Inland Steel Co.	1,104,537*	529,373*	1,012,053	166,693*	2,000,000
Wheeling Steel Corp.	58,333	227,490	802,419	284,430	1,500,000
Ludlum Steel Co.	170,235*	81,993*	107,756	161,063*	38,000
Total	$ 7,894,647	$10,429,452	$33,163,284	$60,332,328	56,565,000

On United States Steel Corp. bonds outstanding	3,362	1,266,071
Total deficit from operations		$ 5,482,565
Add, proportion of overhead expenses (of which taxes alone are $1,301,925) of the Lake Superior Iron Ore properties and Great Lakes transportation service, normally included in the value of the season's production of ore carried in Inventories, but which because of curtailment in tonnage of ore to be mined and shipped in 1934 is not so applied		1,507,400
		$ 6,989,965
Dividend for the quarter on stock of United States Steel Corp.: Preferred, ½%		1,801,405
Total deficit for the quarter provided from undivided surplus		$ 8,791,370

Bethlehem Steel Corp.

Increased costs due largely to labor gave Bethlehem Steel Corp. a deficit of $902,044, after all charges, in the first quarter, compared with a profit of $629,671 in the final quarter of 1933, but compared with a deficit in the first quarter of 1933 the showing was an improvement of almost $5,000,000. Details of the Bethlehem showing follow:

	First Quarter 1934	Fourth Quarter 1933
Total income of the corporation and its subsidiary companies	$4,025,956	$5,790,023
Less—interest charges	1,672,730	1,692,586
Balance	$2,353,226	$4,097,437
Less—provision for depletion and depreciation	3,255,270	3,467,766
Net income for the period	*$ 902,044	$ 629,671

*Deficit.

Displaying confidence for the remainder of the second quarter, E. G. Grace, president, indicated that earnings would be greater in the second quarter, although the full force of advances in numerous finished steel prices will not become fully effective until the third quarter. Since March 31, Mr. Grace said, the improvement in orders has been encouraging.

Youngstown Sheet & Tube Co.

Steady improvement is indicated by the deficit of $1,423,468 in the first quarter, being approximately $60,000 below the deficit for the fourth quarter of 1933, and over $2,000,000 under the net loss sustained in the opening quarter of 1933.

H. G. Dalton, chairman, forecast increased business from the railroad, automotive, petroleum and building lines. He said: "Our business would be greatly helped if increases of sales could be obtained for steel used in the production of capital goods. The securities act of 1933 unquestionably is preventing loans and until the act is modified little improvement in capital goods production can be expected."

Republic Steel Corp.

March operations were sufficiently profitable to practically wipe out losses sustained in January and February, giving the corporation a net loss for the quarter of only $58,682, after all charges, compared with a deficit of $1,268,472 in the fourth quarter of 1933, and $2,521,569 in the first quarter. In the quarter just ended depreciation amounted to $1,966,655, interest to $794,823, and maintenance and repairs to $2,428,493.

Jones & Laughlin Steel Corp.

First quarter deficit of $1,924,524 is slightly under the loss of $2,060,645 in the first quarter of 1933. It is almost triple the loss of $626,418 in the fourth quarter of 1933. Consolidated income account for the first 1934 quarter shows operating loss of $669,882, depreciation charges of $1,158,953, and funded debt charge of $95,689, making total loss $1,924,524.

National Steel Corp.

First quarter net earnings, after charges, at $1,642,328, show the greatest improvement of any major integrated producer. In the fourth quarter of 1933 National's net was $242,530, and in the first quarter, $280,845. Consolidated income summary for the quarter just ended disclosed $3,345,973 profit from operations. First quarter net equals 76 cents per share, or three times the current dividend.

Inland Steel Co.

From a deficit of $1,012,053 in the first quarter of 1933 to a profit of $1,104,037 in the first quarter of 1934 is the record of this Chicago district producer. The last quarter profit was practically double the net of $529,373 in the fourth quarter of 1933. Against net income of $2,327,704 there were deductions of $777,542 for depreciation and depletion, and $455,625 for bond interest.

Wheeling Steel Corp.

Substantial improvement over a year ago is indicated by a deficit of only $58,333, after charges, compared with a net loss of $802,419 in the first quarter of 1933 and a deficit of $227,490 in the fourth quarter.

¶Other financial showings for the first quarter, after charges, are:

General Refractories Co., Philadelphia, net profit of $144,723; loss of $205,356 a year ago.

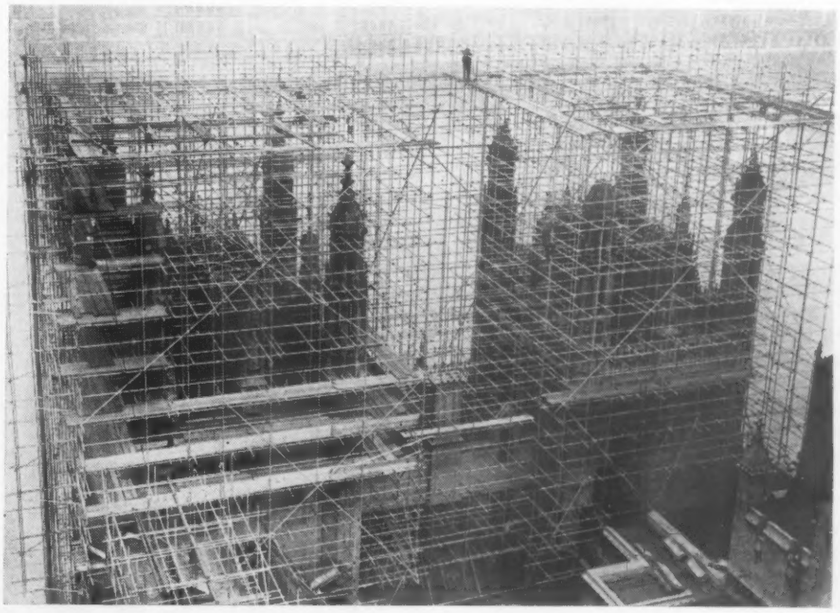
Pittsburgh Screw & Bolt Corp.,

(*Please turn to Page* 16)

NRA

GENERAL JOHNSON, April 25, approved for a 90-day trial period a uniform method of cost accounting for the malleable iron industry. The provision for a waiting period between the time of filing and the effective date of price lists was suspended.

¶Code hearings scheduled: May 1, wire reinforcement; May 4, lock and



STEEL HELPS CLEAN UP BRITISH GOVERNMENT: Tubular scaffolding surrounding speaker's house of the Houses of Parliament in London, which is being renovated. Acme photo

builders' hardware; May 8, ornamental and miscellaneous iron, bronze wire and metal specialties, complete wire and iron fence; May 9, pipe line construction; May 10, vises, pipe tools; May 14, metal compartments.

¶Codes approved: Steel tire manufacturing and railway and industrial spring industries, both effective May 4.

¶Benjamin Schwartz, director- general, Institute of Scrap Iron and Steel Inc., New York, has been elected chairman of the code authority for the scrap iron and steel trade. Other code authority officers: Vice chairman, Darwin Luntz, of Luntz Iron & Steel Co., Canton, O.; secretary-treasurer, Dan R. Cohen, of D. R. & F. A. Cohen, Chicago.

Labor

AMALGAMATED Association of Iron, Steel and Tin Workers in the second week of its convention at Pittsburgh last week partially approved the report of the wage committee recommending a 15 per cent advance in the puddling and sheet mill scales. The tin mill scale still is under consideration. Apparently this proposed advance is on top of two voluntary increases of 10 per cent granted by employers since last fall.

Handling the convention, especially the new leaders that have sprung up with the organization of 137 lodges during the past year, taxed the abilities of Michael F. Tighe, long-time president of the Amalgamated. One resolution calls for halving union dues. Many delegates are said to favor a return to the former system of basing tin plate workers' wages on the selling price of finished products.

¶To combat the government's suit for a preliminary injunction in the Delaware courts, the Weirton Steel Co. last week filed at Wilmington 819 affidavits signed by more than 1000 persons, refuting the charge that there was coercion, restraint and intimidation of workers in the employe representative elections at Weirton plants last Dec. 15.

A hearing Monday, April 30, before Judge John P. Nields at Wilmington was to develop arguments on an injunction whereby the government seeks to compel Weirton to provide payroll lists for a new election. Weirton, incidentally, continues to receive contracts under PWA allotments, its blue eagle not yet being jeopardized by the suit.

¶National labor board reports the following result of an election April 20 at the Thomas furnace of the Republic Steel Corp., Birmingham, Ala.: For the company representation plan, 8; for American Federation of Labor representation, 282.

Iron ore mine labor—mostly negro—of southern iron and steel producers is threatening to strike unless its wage demands, reaching as high as 70 per cent increase, are met.

¶It was announced in Washington Friday that a cabinet committee is working on a modified Wagner Bill.

¶Haynes Stellite Co., Kokomo, Ind., has increased wages 10 per cent.

¶Re-employment in the St. Louis district: 650 at the Commonwealth division of the General Steel Castings Corp., Granite City, Ill.; 500 at the East St. Louis, Ill., works of the American Steel Foundries; and employment increased to 600 at the Laclede Steel Co., Alton, Ill.

They Say:

MUCH more proposal work is being done at present, indicating that considerable planning for improvements in plant equipment is going on in the steel industry and as some of the present difficulties are eliminated further substantial orders should be placed. Legislation, past and pending, has had serious effect in retarding improvement which was apparent last fall. I sincerely hope that such modifications will be made as will permit the early release of new business which has been withheld because of the effects of such legislative threats."—George T. Ladd, president, United Engineering & Foundry Co., Pittsburgh.

¶"All users and sellers of machinery, mechanical equipment, second hand automobiles and mechanical items, shall sell at scrap valuation any that has existed through a ten year depreciation period. These to be actually scrapped to go out of existence. The value of such to be carried on a foundry's book to the credit of seller against future orders for the foundry product, or to be paid in cash if the foundry is financially able. The value of such to be paid in cash or on credit terms by the junk dealer, who can borrow for large volume purchases from RFC or banks and charge cost of borrowing into his selling price. Borrowing to be made on actual realization—not a matter of desperation and pleading."—S. A. Smith, manager, gear department, Meisel Press Mfg. Co., Boston, in a program to the President to stimulate work.

Convention Calendar

May 3-4—American Gear Manufacturers' association. Annual meeting at Penn-Lincoln hotel, Wilkinsburg, Pa. J. C. McQuiston, 221 Penn-Lincoln hotel, Wilkinsburg, Pa., is manager-secretary.

May 16-17—Porcelain Enamel institute. Fourth annual meeting at Hotel Statler, Cleveland. George P. MacKnight, 612 North Michigan avenue, Chicago, is secretary.

May 24—American Iron and Steel institute. Forty-third general meeting at Hotel Commodore, New York. H. H. Cook, 1829 Empire State building, 350 Fifth avenue, New York, is secretary.

June 11-14 — American Electro-Platers' society. Annual meeting at Hotel Statler, Detroit. H. A. Gilbertson, 434 South Wabash avenue, Chicago, is secretary.

June 18-22—National Association of Purchasing Agents. Annual convention and exhibition, Hotel Cleveland. George A. Renard, 11 Park Place, New York, is secretary.

June 25-29—American Society for Testing Materials. Thirty-seventh annual meeting at Chalfonte-Haddon hall, Atlantic City, N. J. C. L. Warwick, 260 Broad street, Philadelphia, is secretary.

May 14-15—Machinery and Allied Products institute. Meeting at Hotel Cleveland, Cleveland. H. E. Christiansen, 221 North LaSalle street, Chicago, is secretary.

Foreign

DOMINION STEEL CORP., Sydney, N. S., has booked 24,000 tons of steel products for export to Great Britain and New Zealand, putting its recent sales above the 1929 level. Export business in wire and nails to Britain and Australia has been heavy recently, in addition to rail orders from the Canadian Pacific and Canadian National.

Production

STEELMAKING operations last week advanced 2 points to 57 per cent, thereby equaling the peak of the third week of last July. Indications are that the current week will develop another gain. In all districts save Youngstown, steel schedules last week were stationary or improved, such important districts as Chicago and Pittsburgh expanding 5 and 3 points, respectively. Details for various districts follow:

Chicago — Advanced 5 points by the end of last week to 59 per cent, with further improvement indicated for this week. Output now approximates last year's peak rate of July. Eleven of 36 steelworks blast furnaces are active, and at least one additional stack will be blown in this week.

Wheeling—Increased 6 points to 79 per cent, with 30 out of 39 open-hearth furnaces operating in the four district plants of three producers. This is the highest rate for the Wheeling district since last July. Wheeling Steel Corp. announces full operations at Benwood works beginning April 30.

Pittsburgh—A 3-point advance to 46 per cent was recorded last week, with indications pointing to a slight rise to 47 per cent this week. Four more blast furnaces were blown in, making 26 out of 60 steelworks blast furnaces operating. Carnegie

Steel Co. added another Edgar Thomson furnace, Jones & Laughlin blew in a fourth south side furnace, Bethlehem Steel Co., at Cambria, blew in a fifth stack, and National Tube Co. blew in its No. 4 blast furnace at McKeesport, Pa., marking the first operation of this stack in four years. However, Jones & Laughlin may blow out a smaller south side furnace this week. Individual blast furnace rates now are as follows: Carnegie Steel Co., 10 out of 32; Jones & Laughlin Steel Corp., 7 out of 11; Bethlehem Steel Co., 5 out of 7; National Tube Co., 1 out of 2; and the following 1 out of 2 each: American Steel & Wire Co., at Donora, Pa., Pittsburgh Crucible Steel Co., at Midland, Pa., and Pittsburgh Steel Co., at Monessen, Pa. National Tube resumes with two bessemers, a blooming and a skelp mill this week at the McKeesport works.

Detroit—At 94 per cent last week, steel ingot production in the plants of two district producers was unchanged, with 16 out of 17 open-hearth furnaces being operated, one large duplexing furnace, and all four of the district's blast furnaces. The one inactive open hearth is still down for relining.

Birmingham—Remained at 52 per cent last week, with no change indicated unless labor troubles interfere. Thirteen open hearths continue active.

Buffalo — Up 11 points to 8 per cent last week, with 26 open hearths in the district on, the greatest number in many months. All are scheduled to continue during the early part of May and probably for a longer period.

Central eastern seaboard — Advanced 1½ points to 41½ per cent, with a further slight gain expected this week.

Cleveland-Lorain—Up 6 points to 80 per cent, with Corrigan, McKinney Steel Co. operating 13 of its 14 open hearths; Otis Steel Co., 7 of its 8; and National Tube Co., Lorain, 11 of its 12. Republic Steel Corp. this week will start the 11-inch bar mill at its Upson plant, Cleveland, down since April, 1932. Interlake Iron Corp. has lighted its second blast furnace at Toledo, O.

Youngstown—Declined 2 points to 58 per cent last week, with a rise to 60 per cent expected at start of this week. Fifty-three of 83 open hearths, and two of four bessemers are producing ingots. Two blast furnaces are being prepared for early blowing in.

New England—Continued at 89 per cent last week, and probably will maintain the same rate throughout this week.

¶Bookings of fabricated structural steel in March, according to preliminary reports from 66 per cent of the industry to the American Institute of Steel Construction Inc., were the largest of any month this year. They were 18 per cent larger than average bookings for last quarter, 1933.

Records

BRITISH MANNESMANN TUBE CO., Newport, Monmouthsire, England, claims to have produced the largest steel tube on record—170 feet long, 8 inches in diameter, a half inch thick.

¶British Insulated Cables Ltd., Prescott, Lancashire, England, is drawing wire with a diameter of two-thousandths of an inch, measuring 15½ miles to the pound. Its five coats of electrical insulation of enamel have a radial thickness of two ten-thousandths of an inch.

¶Claimed to be the largest lathe ever built is a unit which will take forgings up to 60 feet long and 88 inches in diameter, operated by a 250-horsepower motor. It was made for the English Steel Corp. by Noble & Lund, Felling-on-Tyne, England.

Washington

PRESIDENT ROOSEVELT has approved the tariff commission's report recommending no change in the present tariff rate of ¼c per pound on cotton ties. The commission compared domestic costs and foreign invoice prices and failed to find an adequate basis for determining enough difference to warrant revising duty.

Metal Trades Group Fearful of Gov't. Policies; Sellers Is New President

NRA, the Wagner bill, and the securities act came in for particular censure at the thirty-sixth annual convention of the National Metal Trades association held in New York, April 25-26. Grave fears were entertained for the eventual outcome of the administration's economic and industrial policies, with full credit given for whatever measure of revival they have imparted.

New officers elected were: President, Alexander Sellers, who is president, William Sellers & Co. Inc., Philadelphia (See p. 17); first vice president, Charles H. Strawbridge, second vice president, Goodman Mfg. Co., Chicago; second vice president, N. W. Pickering, Farrel-Birmingham Co. Inc., Ansonia, Conn.; treasurer, Harold C. Smith, Illinois Tool Works, Chicago.

Councilors elected for two years are E. B. Baltzly, Warner Gear Co., Muncie, Ind.; Jacob D. Cox Jr., Cleveland Twist Drill Co., Cleveland; Harold Falk. The Falk Corp., Milwaukee; D. F. O'Brien, A. P. Smith Mfg. Co., East Orange, N. J.; F. O. Payne, Metric Metal Works, Erie, Pa.; and A. H. Timmerman, Wagner Electric Co., St. Louis.

Maintaining that NRA missed a golden opportunity when it failed to stabilize wages last June, Jacob D. Cox Jr., retiring president, declared NRA was now in full flight on a course leading to national bankruptcy and disaster. Only a readjustment of wage rates that would regain a normal price relationship between farm and industrial products can return normal prosperity.

Not only is the metalworking industry faced with a severe shortage of skilled labor but the situation also will grow worse before it becomes better, Mr. Cox predicted. This shortage he ascribed largely to restricted apprenticeship training activities during the depression, aggravated by a loss of 30 to 40 per cent in skilled labor due to normal mortality and relocation during unemployment.

Mr. Cox, in discussing the economic policies of the federal administration, declared various fallacies existed in the doctrine that seems to have been accepted by Washington that depressions are due to overproduction of consumers' goods by industry and that higher wages will give the wage earners greater purchasing power and so tend to produce recovery.

The doctrine briefly, is fallacious (1) because there is no such automatic and inevitable process of overproduction as it assumes; (2) because it confuses money with purchasing power; (3) because it assumes wage earners constitute the bulk of the population, commonly estimated at 90 per cent, whereas they probably amount to less than 50 per cent; (4) because it assumes that wages can generally be raised without causing similar increases in prices; and (5) because it confuses money with wealth. It assumes that higher wages will make all rich and prosperous whereas in reality riches flow only from production of goods. If to gain higher wages he said, production is expected, the result is not increased wealth, but directly the reverse, increased poverty.

The theory, he continued, is fal-

lacious (6) because it ignores the necessity for balanced prices between industrial goods and agricultural goods; and (7) because it ignores the fact that the industries and industrial workers of this country are in competition with those of all other countries and that this country cannot get its fair share of world trade and thus provide workers with jobs when costs are set up upon a wholly artificial level, far above those of other countries. Tariffs, Mr. Cox said, can keep the goods of other nations out but there is no similar means of providing outlets for American goods in neutral markets if they are overpriced.

John L. Lovett, general manager, Michigan Manufacturers' association, Detroit, while condemning the political and compulsory aspects of unemployment insurance, and stating that the Wagner-Lewis provisions represented an unwarranted tax on industry, believed that manufacturers should devote careful thought to developing a plan for providing financial protection for employes in times of business stress.

Mr. Lovett, who discussed metalworking problems, particularly from the standpoint of the automotive industry, said that automobile and parts manufacturers were confronted with four major problems, one having to do with further details in the operation of company unions, another with inside management, the relationship between the foreman and his men, and still another with stabilization of production.

He said that Dr. Leo Wolman, of the automobile labor board was devoting considerable attention to the problem of stabilizing automobile production. Dr. Wolman was successful in working out a stabilization plan in the men's clothing industry.

ORIGIN OF MARCH IMPORTS

Gross Tons

	Pig iron	Manganese ore	Ferromanganese
Belgium	50	.....	.....
Netherlands	15,786	.....	.....
Kwantung	118	.....	.....
Sweden	200	.....	.....
United Kingdom	50	.....	195
Canada	1,129	.....	1,168
British India	3,341	2,005	.....
France	.....	1	3
Soviet Russia in Europe	.....	10,063	.....
Brazil	.....	3,717	.....
Gold Coast	.....	526	.....
Italy	.....	.....	8
Norway	.....	.....	1,608
Poland	.....	.....	79
Total	20,674	16,312	3,061

	Sheets, skelp and sawplates	Structural steel	Steel bars	Hoops and bands
United Kingdom	1	.....	37	50
Belgium	107	1,059	353	460
Germany	259	75	25	725
Sweden	4	.....	390	4
Switzerland	.....	2	.....	.....
France	.....	622	212	634
Canada	.....	3	.....	.....
Austria	.....	.....	2	.....
Czechoslovakia	.....	.....	12	.....
Total	371	1,761	1,031	1,273

Steel Exports Make Heavy March Gain

STEEL and iron exports of the United States in March were the highest of any month since July, 1929, according to the iron and steel division, department of commerce. Imports made a higher mark than for any month since October, 1933.

March exports were 261,269 gross tons, compared with 151,184 tons in February, a gain of 110,085 tons. However, exports of scrap rose 97,281 tons, thus reducing the increase to 12,804 tons as represented in goods finished or partly finished by American labor. This excess over February came from larger exports of skelp, galvanized sheets, black sheets, tin plate, steel rails, welded oil pipe and cast iron pipe, all of which showed good increases.

Imports were 38,393 tons in March, against 25,407 tons in February, a growth of 12,986 tons. The larger imports resulted from pig iron, which rose from 10,777 tons in February to 20,674 tons in March, and also ferromanganese and spiegeleisen.

Exports for three months in 1934 totaled 590,476 tons, compared with 201,172 tons for the same period in 1933. Imports on the same basis were 86,453 tons in 1934 and 63,457 tons in 1933. Export trade thus was almost three times that of the preceding year, while imports increased less than 50 per cent.

FOREIGN TRADE OF UNITED STATES IN IRON AND STEEL

Gross Tons

	1934 Imports	1934 Exports	1933 Imports	1933 Exports
Jan.	22,653	178,023	21,892	56,720
Feb.	25,407	151,184	19,748	63,936
Mar.	38,393	261,269	22,114	80,567
3 mo.	86,453	590,476	63,457	201,172
April	.....	.....	28,061	100,395
May	.....	.....	26,295	123,069
June	.....	.....	34,368	102,581
July	.....	.....	52,805	83,311
Aug	.....	.....	46,839	119,374
Sept.	.....	.....	55,706	108,799
Oct.	.....	.....	46,673	164,755
Nov.	.....	.....	28,979	157,600
Dec.	.....	.....	31,310	184,585
Total	.....	.....	414,790	1,350,692

UNITED STATES IMPORTS OF IRON AND STEEL PRODUCTS

Gross Tons

	March 1934	Feb. 1934	March 1933
Pig iron	20,674	10,777	9,314
Sponge iron	121	28	.....
Ferromanganese, spiegeleisen	3,061	2,729	2,071
Ferrochrome	2	17	5
Ferrosilicon	28	28	.....
Other ferroalloys	.....	.....	.....
Scrap	6,056	4,343	491
Steel ingots, blooms, etc.	179	67	15
Concrete bars	26	229	303
Hollow bar, drill steel	63	48	74
Merchant steel bars	1,031	1,254	1,506
Iron slabs	.....	.....	.....
Iron bars	17	26	17
Wire rods	1,300	864	1,017
Boiler and other plate	26	6	15
Sheets, skelp, saw plate	371	348	1,042
Tin plate	23	2	87
Structural shapes	1,761	1,523	2,168
Rails and fastenings	201	186	52
Cast iron pipe, fittings	.....	1	10
Welded pipe	109	221	435
Other pipe	302	279	127
Barbed wire	444	347	799
Round iron, steel wire	241	147	420
Telegraph, telephone wire	1	.....	.....
Flat wire, strip steel	122	184	71
Wire rope, strand	130	103	116
Other wire	93	64	116
Hoops and bands	1,273	1,040	1,077
Nails, tacks, staples	540	414	620
Bolts, nuts, rivets	18	25	11
Horse and mule shoes	30	10	36
Castings and forgings	150	97	99
Total	38,393	25,407	22,114

UNITED STATES EXPORTS OF IRON AND STEEL PRODUCTS

Gross Tons

	March 1934	Feb. 1934	March 1933
Pig iron	186	326	105
Ferromanganese, spiegeleisen	2	6	.....
Iron and steel scrap	173,165	75,884	57,522
Ingots, blooms, billets, slabs and sheet bars	766	679	154
Bars, iron	25	58	49
Bars, steel	3,121	3,348	1,223
Bars, alloy steel	347	163	165
Wire rods	1,180	1,190	148
Boiler plate	152	78	25
Other plate, not fabricated	1,703	2,689	154
Skelp, iron or steel	2,249	817	83
Iron sheets, galvanized	213	81	33
Steel sheets, galvanized	7,738	4,263	2,563
Steel sheets, black	7,194	4,912	2,277
Iron sheets, black	349	157	125
Strip steel, cold rolled	1,431	892	541
Hoop, band, and scroll iron or steel	1,607	992	735
Tin, terne plate	27,264	16,512	3,394
Water, oil, gas and other tanks, except lined	758	1,648	113
Shapes, not fabricated	1,278	1,505	472
Shapes, fabricated	882	1,047	1,089
Plates, fabricated	80	237	16
Metal lath	107	86	24
Frames, sashes and sheet piling	691	417	103
Rails, 50 pound	3,741	10,648	104
Rails, under 50 pounds	11	463	.....
Rail fastenings	1,165	1,654	22
Switches, frogs, crossings	183	98	10
Railroad spikes	215	631	35
Railroad bolts, nuts	207	332	18
Boiler tubes, seamless	355	485	248
Boiler tubes, welded	16	69	25
Casing and oil-line pipe, seamless	2,721	2,967	1,276
Casing and oil-line pipe, welded	2,179	596	89
Seamless, black pipe, other than casing	578	167	68
Malleable iron screwed pipe fittings	222	238	235
Cast iron screwed pipe fittings	163	174	65
Cast iron pressure pipe and fittings for	1,302	628	167
Cast iron soil pipe and fittings for	98	591	287
Welded black steel pipe	2,431	1,105	948
Welded black wrought iron pipe	64	86	136
Welded galv. steel pipe	2,610	1,668	982
Welded galvanized wrought iron pipe	36	137	33
Riveted iron or steel pipe and fittings	31	3	1
Plain iron or steel wire	1,227	836	322
Galvanized wire	1,615	2,538	249
Barbed wire	3,115	3,214	1,625
Woven wire fencing	118	110	66
Woven wire screen cloth	62	59	73
Wire rope	220	120	233
Other wire and manufactures	328	313	179
Wire nails	1,300	966	482
Horseshoe nails	76	67	58
Tacks	48	45	36
Other nails, staples	427	263	153
Bolts, machine screws	295	398	312
Iron castings	907	814	317
Steel castings	61	61	100
Car wheels and axles	306	391	250
Horseshoes	6	1	1
Iron and steel forgings, n.e.s.	342	261	249
Total	261,269	151,184	80,567

WINDOWS OF WASHINGTON

Still Swinging to "Right"

• • •

Hull Plates Now Galvanized

• • •

Lobbying Ban an Empty One

WASHINGTON

NOT in 12 years has Washington been so overwhelmed with visitors as during the past week. Attendance at conventions held annually during the brief season of cherry blossoms ordinarily fills the hotels comfortably.

But manufacturers and business men in these days arrive daily by the thousands, so that private householders, through appeals by radio and newspapers, were pressed into service as hosts.

Harmonizing with this gala atmosphere, administrative policies continue to become less alarming to business and industry. In addition to having regained control of congress, President Roosevelt has taken his stand in firm opposition to any kind of inflation in currency through silver certificates or any other form of tinkering with money.

He has rejected the McLeod bill, by which the government would pay depositors in closed banks. And he now is giving the major share of his attention to a plan for stimulating building construction and the durable goods industries.

A new bill, to take the place of the widely-opposed Wagner bill, appears to be about ready for introduction in congress. It is expected this will be passed before the session ends. It is to be the product of conferences participated in by President Roosevelt, Senator Wagner, Secretary Perkins, General Johnson, Donald R. Richberg and Harry L. Hopkins. The President is being more and more besieged to arbitrate labor disputes and is anxious to be relieved of these demands.

While no official description of the new Wagner bill has been announced, it is known that it will be free of substantially all the features which were strongly opposed in the original bill.

It will provide a permanent labor arbitration board, with authority somewhat comparable to that of the interstate commerce commission. The board would have power to issue cease and desist orders in cases where prohibited labor practices had been contravened, it is understood. Functioning in this way, of course, much would depend on the selection of the membership of this board.

PROGRESS has been made in planning the co-ordination of present government housing activities and it now is likely that something definite will be announced within the next week. The Walker plan is expected by the administration to stimulate house building and renovation to such an extent that it will reach the magnitude of CWA.

The basis of the Walker plan is the general mortgage. This is expected to be guaranteed, both principal and interest, by the government. But it will be private money that is spent, not government money.

The Walker plan does not only apply to house building and renovation. It covers the financing of small industries under guaranteed mortgages. It is expected by its proponents that this plan will stimulate greatly the purchase of durable goods.

In some directions here it is felt that an all-steel house would not stand so good a chance of approval by the government housing experts as a composite house. To win full approval, it is believed, a composite house would be considered satisfactory provided that a substantial amount of labor would have to be done in erecting the house so as to provide employment.

Also, provided that such a house would sell at somewhere around $2500, so as to be saleable to low-income earners. It is rumored that a part-steel house has been developed to meet the requirements of government engineers.

FOR the first time the United States coast guard is using heavy galvanized steel plates in hull construction for the purpose of reducing incipient corrosion.

This material will be used primarily for deck plating. Thin galvanized steel plates have been used for a number of years for joiner bulkheads, partitions, etc., but this marks the first time galvanized material is being used in hull construction.

The vessels to be thus constructed are seven in number, four to be built at Philadelphia two at Brooklyn and one at Charleston, S. C.

The plates and sheets were distributed as follows: 1000 tons to Joseph P. Cattie Bros., Philadelphia; 1119 tons to the Pennsylvania Galvanizing Co., Philadelphia; 764 tons to the Alan Wood Steel Co., Conshohocken, Pa.; 950 tons to Jones & Laughlin Steel Corp., Pittsburgh; 500 tons to Carnegie Steel Co., Pittsburgh; 437 tons to Central Iron & Steel Co., Harrisburg, Pa., and 262 tons to Joseph T. Ryerson & Son Inc., Chicago.

The shapes were distributed as follows: 965 tons to Bethlehem Steel Co., Bethlehem, Pa.; 529 tons to John T. Hill, Washington, representing the Central Iron & Steel Co.; 333 tons to Joseph T. Ryerson & Son Inc., 210 tons to the Pennsylvania Galvanizing Co., 172 tons to the Carnegie Steel Co., 182 tons to the Enterprise Galvanizing Co., Philadelphia, and 18 tons to the Jones & Laughlin Steel Corp.

Identical prices were quoted under the NRA steel code, and awards were made by drawing capsules out of a tin box.

THE treasury and navy departments now are giving joint attention to that portion of the Vinson act which provides that naval contractors under this act shall not be permitted to

earn profits in excess of 10 per cent. This restriction, it is learned, will apply only to contracts for new ships. It will not apply to contracts for materials used in repairs and maintenance of naval vessels.

Setting up a method to compute the profits is proving a difficult task. What items of overhead, as well as operating expenses, will be figured in the cost? To what extent may statements of contractors be accepted under the law, and to what extent will the government go in examining into corporate affairs in order to make a thorough cost analysis? These are questions involved in the effort to set up a formula.

The Vinson act, according to some observers here, distinctly encourages companies to organize new companies for the exclusive purposes of executing contracts for new ships under the Vinson act.

This would result in the keeping of a separate set of books which would show the costs of carrying out the naval contract, and without being affected or confused by other, separate operations.

Of course, it is pointed out, there might be some temptation on the part of such contractors to saddle on the new company a large share of the overhead of the parent company, but it is felt that the vigilance now being exercised in keeping track of government contractors would prove an effective preventative of abuses along these lines.

A NEW restriction on contractors has been placed in effect by the war department. Several months ago the war department took bids on some $10,000,000 of army motorization equipment. President Roosevelt halted the transaction due to widespread charges of lobbying to influence the award of this business.

The department of justice investigated but found no violation of the law. Nevertheless, the time limit on the former bids has expired and new bids will be taken.

The new restriction prevents the army from doing business with any concern employing lobbyists. Each bidder hereafter will have to take affidavit that it "has not employed and will not employ any person, other than a bona fide established commercial or selling agency maintained by the bidder for the purpose of securing business."

To those familiar with Washington, the order lacks definiteness. And it will have no effect in eliminating contacts which have been established in a great many cases and which do not come under the head of lobbying.

It is not considered lobbying to call on a friend who happens to be an influential congressman or government official. It is no misdemeanor to invite a government purchasing officer to the ball game.

What is a subcontractor? That is a question which is being raised by manufacturers all over the country since Secretary Ickes recently ruled that "bid-peddling" would not be permitted in connection with PWA-financed contracts.

So far, the PWA director has not issued a definition of the term subcontractor, thus making it necessary for bidders to form their own interpretation.

General contractors engaging in building construction work say a subcontractor is one who takes a contract directly from the general contractor, but nobody who is not under contractual relations with the general contractor can be considered a subcontractor.

But a somewhat different view is held by certain interests in the steel and equipment field. In their opinion a car-seat manufacturer would be a subcontractor if he supplied seats for PWA-financed cars. They believe that the manufacturer of car-seat fabric would be a subcontractor if he furnished goods specially designed for this job, like weaving the name of the railroad in the cloth; they believe he would not be a subcontractor if he furnished standard fabric.

It is intimated that future specifications may state specifically what parts of each job will be regarded by purchasing officers as subcontracts.

FULL provision now has been effected for adequately caring for the foundry sand industry under the code of the crushed stone, sand and gravel, and slag industry.

Foundry sands are represented in the code authority's divisional committee on industrial sands. This committee has a chairman and six vice chairmen.

The chairman is A. Warsaw, Wedron Silica Co., 38 South Dearborn street, Chicago. Mark McKee, Sand Products Corp., Detroit, is vice chairman for foundry sands, unbonded. A. J. Miller, Whitehead Bros. Co., 537 West Twenty-seventh street, New York, is vice chairman for foundry sands, bonded.

Under this industrial sands divisional committee are 16 regional industrial sands committees covering all parts of the country, and organized to administer the code in accordance with local conditions.

Problems of foundry sand producers may be filed with these regional committees, which, if necessary, will refer them to the code authority which, in turn, and if necessary, will consult with the proper vice chairman of the divisional committee on industrial sands. The code authority has its headquarters in the Munsey building, Washington.

Financial

(*Concluded from Page* 11)

Pittsburgh, net of $69,350; deficit of $203,925 a year ago.

Edward G. Budd Mfg. Co., Philadelphia, loss of $15,457, compared with loss of $397,488 in first quarter of 1933. A profit has been earned beginning with March.

Allis-Chalmers Mfg. Co., Milwaukee, net loss of $677,153, against loss of $869,986 a year ago.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., net loss of $1,776,152, against loss of $3,491,572 one year ago.

Ludlum Steel Co.

Net earnings in the first quarter after depreciation and general taxes but not federal income tax was $170,235, compared with net loss of $107,756 in the first quarter of 1933. After deduction of the preferred dividend, paid April 11, balance of earnings was 47 cents per common share.

A. M. Byers Co.

First quarter showing is a net loss of $183,902, contrasted with a deficit of $326,214 in the March quarter of 1933. For the past six months the deficit is $440,574, against a loss of $611,257 in the like period of the previous fiscal year.

¶Rustless Iron & Steel Corp., Baltimore, shows a net loss, after charges, of $15,496 for the ten months ended Dec. 31. In the year ended Feb. 28, 1933, the net deficit was $96,704.

¶Harbison-Walker Refractories Co., Pittsburgh, in declaring a 25-cent common dividend last week, made its first payment on the common stock since March 1, 1932. Dividend is payable June 1 to May 22 record. At the same time, the regular 1½ per cent preferred dividend was declared for July 20 to July 10 record.

¶Colorado Fuel & Iron Co., Denver and Pueblo, Colo., had a cash balance of $1,984,773 on Feb. 28, according to Arthur Roeder, receiver and president. This was an increase of $182,000 over Jan. 31.

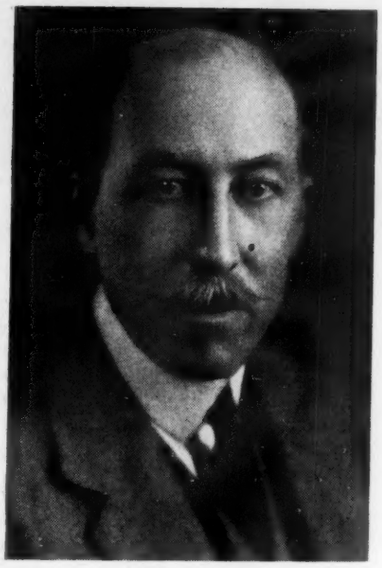
¶Alan Wood Steel Co., Conshohocken, Pa., reports net loss of $579,201, after charges, for 1933, compared with deficit of $860,232 in 1932.

¶General Electric Co., Schenectady, N. J., reports sales billings in the first quarter at $34,936,000, a 35 per cent increase over a year ago. Profit available for dividends for the quarter was $4,566,000, compared with $2,839,000 in the same quarter of 1933.

¶United Engineering & Foundry Co., Pittsburgh, has declared regular quarterly dividends of 25 cents on the common and $1.75 on the preferred stocks, both payable May 11 to May 1 record.

Industrial Men in the Day's News

Alexander Sellers, New President, National Metal Trades Association



Since 1895 he has been indentified with William Sellers & Co. Inc., prominent in metalworking field.

Starting in the shops of his father's company, in ten years he was promoted to the vice presidency.

Becoming president in 1926, he is now well-known for his work in development of heavy machine tools.

ALEXANDER SELLERS, elected president of the National Metal Trades association at its meeting in New York last week (see p. 13), has been a leading figure in the metalworking field for many years. Since 1895 he has been affiliated with the William Sellers & Co. Inc., Philadelphia, and now heads this organization.

Following his graduation in 1895 from the University of Pennsylvania in mechanical engineering, he became associated with the Sellers company which, incidentally, was founded by his father, William Sellers.

He served first as an apprentice, and ultimately worked his way through the shops as foreman and then superintendent. His election to the vice presidency came in 1905 and in 1926 he was named president.

Well known for his efforts toward furthering the development of heavy machine tool equipment, Mr. Sellers devotes some of his time to other business and technical organizations, and likewise maintains an active interest in civic affairs.

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F. B. Olcott, for the past ten years senior materials engineer, bureau of construction and repair, navy department, has resigned to become associated with Col. A. P. Shirley in a newly organized firm of Shirley & Olcott, 220 Mills building, Washington, handling Washington sales representation for the Alan Wood Steel Co., Latrobe Electric Steel Co., Michigan Steel Castings Co., and Bridgeport Brass Co.. Mr. Olcott, after metallurgical experience with the Bethlehem Steel Co., went with the bureau of construction and repair 15 years ago. As senior materials engineer during the past ten years he had charge of the development of materials, the making of specifications and metallurgical research. He is chairman of subcommittee A-5 on corrosion and subcommittee 7 of committee A-10 on stainless steel of the American Society for Testing Materials.

Colonel Shirley, who during the war was commanding officer in charge of the motor transport corps repair base in France, since has represented many leading manufacturers of tools and machinery in Washington.

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E. C. Gainsborg, sales manager, Roller Bearing Co. of America, Trenton, N. J., has resigned, effective immediately.

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Chester K. Brooks, secretary and treasurer, Stewart Furnace Co., Cleveland, was elected to the board of the Youngstown Sheet & Tube Co., Youngstown, O., at the stockholders meeting April 24.

□ □ □

H. S. Colby has been appointed general sales manager of Combustion Engineering Co. Inc., New York, in direct charge of district office activities. Until recently he was president of the Air Preheater Corp. and for the past 20 years has been engaged in design, production and sales of steam generating equipment, including boilers, stokers, pulverizers, economizers and air preheaters.

□ □ □

H. W. Croft, chairman of the board, Harbison-Walker Refractories Co., Pittsburgh, has been elected a director of the Gulf States Steel Co., Birmingham, Ala.

Herbert A. May, assistant to the president, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., also has been elected a director of the Gulf States company.

□ □ □

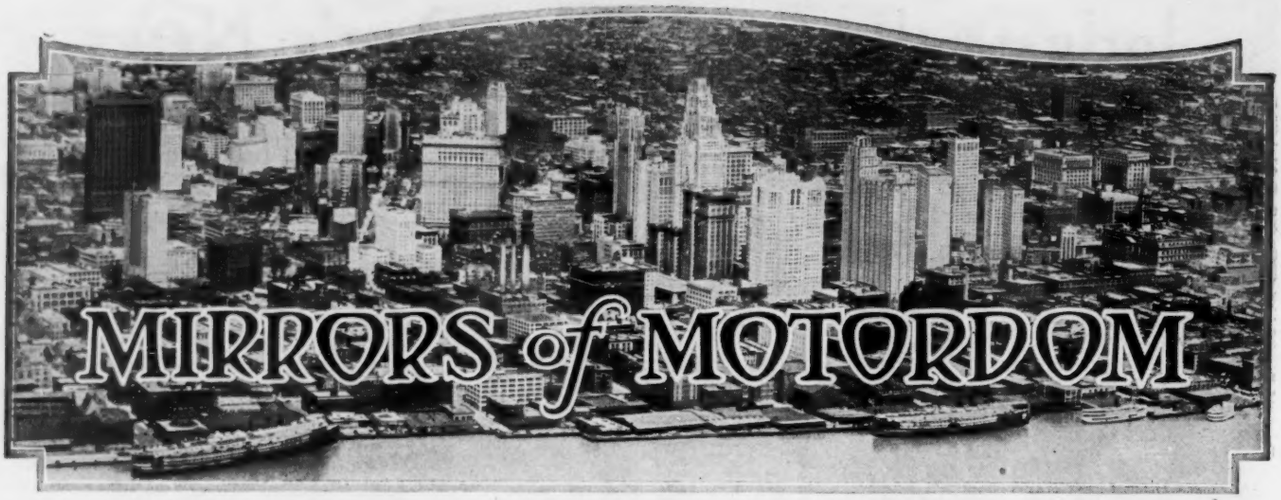
G. Walter Sanborn has been elected vice president in charge of purchases and traffic of the United Engineering & Foundry Co., Pittsburgh. He has been purchasing agent since 1921. Long identified with the steel mill equipment business, he began his career with the William Tod Co., Youngstown, O., in 1902, being employed in the machine shop. In 1909 he became purchasing agent for that company and in 1912 was named field inspector and expediter for the Wheeling Mold & Foundry Co., Wheeling, W. Va.

Blackstone Studio

G. Walter Sanborn

Shortly thereafter he returned to the Tod company which, in 1917, was taken over by United Engineering. At the latter date he was transferred to Pittsburgh as assistant purchasing agent for United and four years later was appointed purchasing agent.

K. C. Gardner, F. C. Biggert Jr. and Carl V. Dodge, in addition to Mr. Sanborn, are vice presidents of the United company.



DETROIT

ONE sure way to beat down the threat of a tool and die strike is not to make any tool and die changes.

Obvious though this deduction may be, it has been only within the last week or two that automobile manufacturers have apparently so fathomed their own strength on the best way to surmount recalcitrant MESA, symbol of tools and dies.

Depression years drove home one fact if nothing else—that no service is indispensable, and Detroit last week first heard that strong moves were on foot to regulate the industry into such a bold move.

If all of the motor manufacturers —particularly those of low-priced cars— were regimented into an ironclad agreement to stand pat in 1935 on their present series, how quickly would the importance of the tool and die makers' union, the MESA, be relegated to a dim background?

True, the idea may border on theory especially with a Ford Motor Co. in the picture, a concern that for years has been as cool to labor unions as to co-operative ideas of brother motor car makers. Yet, actually, Ford of himself has always backed a minimum of model change and quite generally abhored the hole the rest of the industry got itself into when it began predicating sales on regular model changes.

If other car makers can agree among themselves—and even in this secondary stage some Detroit opinion says seeing is believing—a two-fold settlement would result. In addition to nipping professional labor organizers in the bud, perhaps the germ of "de-seasonalizing" the industry's steep labor and production curves would sprout.

At least, the idea is a threat, and a serious one to the one-way antagonism that MESA has persisted in continuing. And, if seriously taken, so that next year's Chevrolet, Plymouth and Hudson turn out to be the same as the present series, the industry will have formulated a new policy.

How the engineering laboratories, now working on advance streamlining, on stamping a body shell from only two sheets, and on rear-engine mounting—just to mention a few innovations for 1935—will take this news, may be the year's best simile for disappointment.

Just now tool and die changes are, of course, at a minimum. The little work that is being carried on is in maintenance and replacement.

But off to the horizon is the summer and early fall when the industry—if it makes changes—will either conceal its new die work by brokeraging through third parties, by awarding work to new sources built up as a result of last fall's strike, or through the aforementioned alternative of standing pat.

Stand Pat To Beat Union?

• • •

April Output Near 400,000

• • •

Making Small Buick Bodies

IN THE meantime, automobile assemblies round out an April that totaled 380,000 to 390,000 cars. That May should be as good is concluded, even though some parts and material suppliers to Detroit's industry say there is a decline in material for May shipment. The latter is no doubt due to the desire of the automobile makers to hold down certain finished inventories, which in some parts have been ahead of assemblies. Assemblies will probably reach a peak late in May, but this cannot be certain.

Against early April, Plymouth has shown little change, assemblies being close to 2000 daily, or if the daily rate varies, each week is accounting for close to 11,000 models. Plymouth, also, has a so-called standard model in production, this job having front-wheel springing deleted.

Incidentally, many Chrysler Corp. models went into dealers' hands recently without panels, molding or trim as a result of the Motor Products strike. Dealers were later supplied parts when the strike lifted.

The balance of the Chrysler Corp. activity finds the airflow DeSotos and Chryslers still unable to hit their full stride. At 300 assemblies daily, the airflows have not yet been able to get any volume on the coupe models, most of production being the closed five-passenger job. The Dodge division is steady at around 600 daily, five days.

Hudson output is over 900 models daily, about 360 being Hudsons, the balance Terraplanes. One whole day's work was lost by the Motor Products strike of early April, still the month accounts for 21,000 models and Hudson's May schedule will reaffirm this total figure. The plant is running three assembly lines, one shift, and although still behind on orders, actually 21,000 cars a month is capacity for one shift. To increase production would mean another shift, and about 7000 more cars per month.

Buick through last week was working for a first week of May deadline on the announcement of its small car. The Fisher Body Co. of Flint has been running through a number of the small Buick bodies recently.

Pontiac, recently coming to the fore in a wider national advertising campaign, has been forced to cut down assemblies to 600 daily, a loss of about 200 per day, because of a delay in receipts on some materials for certain of its models.

Steady assembly rates hold for Olds, although the past week has recorded minor improvement in the individual production rates of La Salle, Cadillac and Reo.

BIGGER and better than ever" is the title of the act the automobile industry puts on in the return

engagement of the Chicago Century of Progress May 26.

Several million visitors came away from the lakefront panorama last year reminiscing of the Chrysler exhibit, or the grandeur of General Motors' vast hall, or the Nash novelty of a showroom in the form of an escalator. But this year, Chevrolet and Ford promise to battle for the degree of pretentiousness.

Ford soon will open its large exhibit that has already been described in STEEL, April 2, pp. 33. But, later was Chevrolet's announcement last week that it will almost place a corner on the electric light bulb market by starting there what it calls the "world's largest electric sign." (See p. 27).

This advertisement, combining a sign and clock that is to have over 17,000 electric light bulbs and 1100 feet of neon tubing, is being built over two driveways and six Michigan Central tracks in Grant Park. In size 148 x 153 feet, it uses 330 tons of fabricated structural steel and 33 tons of enameling sheets.

If and when summer automobile production declines set in, Chevrolet must not forget to count the 25 to 30 master coaches and coupes it will make at its Century of Progress model assembly line. Visitors will be able to see the installation of the knee-action assembly.

CHEVROLET is pouring as high as 2100 tons of gray iron daily at Saginaw, Mich., for motor blocks. . . . Murray has used over 1000 tons of bars and 15,000 tons of sheets in its steel barrel division alone, which just celebrated its first anniversary. . . . Hupp recently has released two lots of cars from its Cleveland body plants. The first was for 2700 jobs, the second closely following called for 2500 models . . . . Olds still is making personnel changes and has had difficulty getting smooth production . . . . Employment at Murray Corp. has been averaging 12,000 men full time in contrast to about 3700 on a three-day week last November . . . . Two automobile concerns in Detroit last week placed orders for 5000 boxes for crating exported automobiles, this order taking around 1,000,000 feet of lumber . . . . Hudson reports a 260 per cent increase in export business so far this year against early 1933, big gains coming from Australia, Scandinavian countries, South Africa, Spain and England . . . . If the automobile plants here ever find the time and available space, the new $700 light airplane the federal director of aeronautics, Eugene L. Vidal, has proposed may be turned over to some of them for manufacturing . . . . Hudson has now made more cars in 1934 than in all of 1933.

Died:

SAMUEL T. JOHNSTON, 67, former president of American Foundrymen's association and until recently vice president of the S. Obermayer Co., Chicago, at his home in Riverside, Ill., April 23. Mr. Johnston was born and educated in Scotland and on coming to this country became identified with the Detroit Car Wheel Co., later being associated with the Detroit Foundry Equipment Co. Following this connection he was identified in various capacities with the Obermayer company and at his retirement recently was vice president and general manager. For many years he was actively identified with the American Foundrymen's association and was the first president of the Foundry Supply association which was organized in 1906 to handle exhibits at annual conventions.

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Maurice H. Stouffer, 51, president of the Ohio Structural Steel Co., Newton Falls, O., in a Youngstown, O., hospital, April 21.

□ □ □

Robert S. Graham, 84, retired official of Charles Graham & Bros., structural iron fabricators, Cincinnati, in that city, April 22.

□ □ □

Joseph E. Scully, 70, during his business career identified with the old Continental works of National Tube Co., Pittsburgh; Pittsburgh Forge & Iron Co.; and with the engineering corps of the Baltimore &

Samuel T. Johnston

Ohio railroad, in Pittsburgh, April 20.

□ □ □

Col. William Thaw II, 40, since the World war trustee of the Thaw Coke trust and a director in Hurd Coal & Iron Co., and other enterprises, in Pittsburgh, April 22.

□ □ □

C. E. Golden, 72, president of Golden-Anderson Valve Specialty Co., Pittsburgh, in that city, April 9. He was well known in engineering and power plant fields.

□ □ □

Walter D. Wood, 84, for 63 years president of R. D. Wood & Co., Philadelphia, cast iron pipe manufacturer, in Washington, April 20, after a short illness. He was a son of the

Walter D. Wood

founder of the Wood company and also headed the Florence Pipe Foundry & Machine Co., Florence, N. J., as well as a number of smaller enterprises. He was one of the organizers and a charter member of the American Foundrymen's association and had attended meetings of that society for many years. He was also a member of the American Society for Metals, American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers and the American Society for Testing Materials. He was the last survivor among six brothers, all of whom were prominent in eastern manufacturing circles.

□ □ □

R. K. Randall, 44, president of the Cleveland School of Welding, in Cleveland, April 24. He was chairman of the Cleveland section of the American Welding society and a member of the Cleveland Engineering society.

□ □ □

Edward S. Day, 54, former secretary and treasurer of Canada Foundries & Forgings Ltd., at his home in Brookville, Ont., April 18, after a lengthy illness.

□ □ □

Fred Doepke, 72, founder and president of the Wrought Washer Mfg. Co., Milwaukee, in Los Angeles, April 22.

EDITORIAL

Congress Not Only Bungler Of Capital Goods Problem

ONE of the by-products of General Johnson's well publicized code authority meeting in the week of March 5 was the appointment of a committee for the durable or heavy goods industries to lay out a program for NRA which would further expedite industrial recovery.

A week ago the committee issued its report. It states the problem clearly:

> "Responsibility for putting industry in a position to function effectively rests directly with congress. Industry must be given freedom to create employment through normal channels, or employment must be found outside the industry. . .
>
> "American industry . . . is trying to aid the government in a plan that will restore work by reviving the private spending that has always been the backbone of our economic system, and thus make unnecessary the huge spending of public funds. Reemployment, however, is being blocked by the presence of laws which choke the flow of money and credit and by proposed bills that go even further in this direction."

The committee does well thus to emphasize the throttling effect of present and pending legislation. It also performed a real service in enumerating five specific modifications in the securities bill which are necessary if the investment of private capital—so vital to the durable goods industries—is to be encouraged.

Congress Responsible Technically, But Impulse Comes from Administration

Probably from the standpoint of propriety the committee was fully justified in placing responsibility for oppressive legislation upon congress. Nevertheless, in the present situation, the plight of the heavy goods industries is more directly chargeable to the national administration than to congress. Insofar as government influence is concerned, most of the damage to these industries is traceable to a deep-seated hostility toward industry which, thinly disguised among a few high authorities in the administration, is openly aped by many of their subordinates.

Early in the days of the new deal, it was not uncommon for visiting industrialists in Washington to hear government employes declare brazenly that the administration had no sympathy with industry. Scores of departmental employes talked unashamedly of the desirability of inaugurating a moratorium on the installation of new machinery and equipment. Every now and then the objections by industry to these expressions became loud enough for General Johnson to deny that the administration intended to restrict the use of machinery. Nevertheless, NRA continued to neglect the heavy industries, while at the same time the White House sponsorship of restrictive legislation dried up the feeble flow of private capital.

But, important as were these influences, they are overshadowed by a more powerful factor, for which the administration also is responsible. This is the factor of uncertainty, which today is the primary deterrent to improvement in the heavy industries.

Uncertainty, Fostered by Vacillation and Inconsistency, Chief Foe of Recovery

One day the administration appears to be committed to a moderate attitude toward industry; the next day it threatens to go further in regimentation. At one moment, the administration declares for the open shop; in the next, it says a closed national union shop must prevail. In one breath, it bans employment insurance from the agenda of this session of congress; in the next, it says such legislation must go through before congress adjourns. Open price policies are "in" today and "out" tomorrow. NRA means one thing on Tuesday, and something else on Wednesday. On rainy mornings, the rule is "soak industry"; on sunshiny afternoons it is "spank labor." On seven days of the week, the general policy is "keep everybody guessing."

Undoubtedly, this is excellent political strategy. Unquestionably it enables the college professors to howl with glee. Undeniably it permits the theorists to pursue their experiments with greater freedom. Certainly for many hundreds of government "advisers"—many of whom never had the responsibility of meeting a payroll on Saturday night, or of facing stockholders at an annual meeting—it is a Roman holiday, where all make merry while industralists, bankers, Wall Streeters, "Tories," and other "unbelievers" are thrown to the wolves.

Unfortunately this spectacle in Washington does not help the private investor to muster courage to put his funds to work. Nor does it encourage the manufacturer to buy equipment he needs badly.

What is needed is a more positive statement of government policy, and some assurance that it will be followed consistently. This is the responsibility of the national administration, not of congress.

THE INDUSTRIAL DIAL

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The Business Trend Section of STEEL
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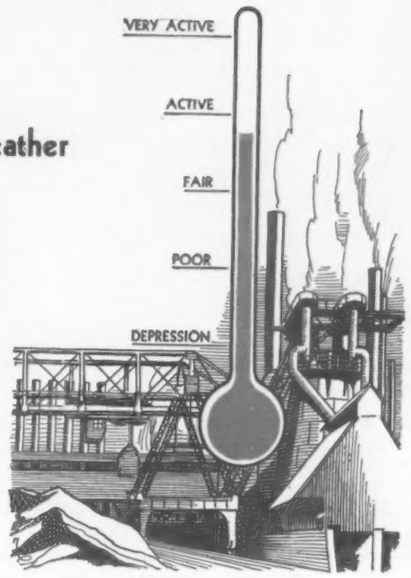
WITH the current rate of steelworks operations ranging in the upper fifties, it is within striking distance of the highest point attained in 1933—the official 59 per cent of last July. The proximity of the two rates suggests that a comparison of the status of business today with its position last July at the peak of the "inflation" spurt may be enlightening.

Industrial production, as reflected in the index of the federal reserve board, stands at about 86 in April as against 100 in July. This would indicate that industrial activity today is about 14 per cent lower than at last year's peak. However, factory employment, as figured by the department of labor, now is 11 per cent higher than it was last July. Payrolls, according to the same authority, today are 32 per cent above their July level. In other words, industry at a lower rate of activity actually is affording a greater volume of employment and paying out nearly a third more in wages!

Freight car loadings in April are slightly ahead of those in July and department store sales are 10 per cent greater. Building contracts are ahead by 57 per cent, but this gain is misleading because the building industry still is so depressed that it continues to be the most discouraging factor in the entire business picture.

Industrial Weather



TREND:

Upward

In the foregoing comparison is found confirmation of the often repeated claim that the present administration at Washington has erred miserably in under-rating the importance of the durable goods industries. From the figures it is clear that the producing and manufacturing industries have sacrificed profits in order to employ more men and to increase payrolls. The

The Barometer of Business

Industrial Indicators

	Mar., 1934	Feb., 1934	Mar., 1933
Pig iron output (Daily average, tons)	52,438	45,385	17,484
Machine Tool Index	.....	104.8	20.1
Finished steel shipments (tons)	588,209	385,500	256,793
Ingot output (Daily average, tons)	103,600	92,232	33,699
Dodge Bldg., awards in 37 states (sq. ft.)	14,788,900	8,176,300	9,890,200
Automobile output	350,173	243,955	125,225
Coal output, tons	38,392,000	31,950,000	23,646,000
Business failures; number	1,102	1,049	1,948
Business failures; liabilities	$27,227,511	$19,444,718	$48,500,212
Cement production, Bbls.	.....	4,168,000	3,684,000
Cotton consumption bales	543,690	477,890	495,183
Car loadings (weekly average)	611,843	577,217	460,300

Foreign Trade

	Mar., 1934	Feb., 1934	Mar., 1933
Exports	.....	$159,671,000	$108,000,000
Imports	.....	$125,292,000	$95,000,000
Gold exports	.....	$51,000,000	$28,123,000
Gold imports	.....	$452,622,000	$14,942,000

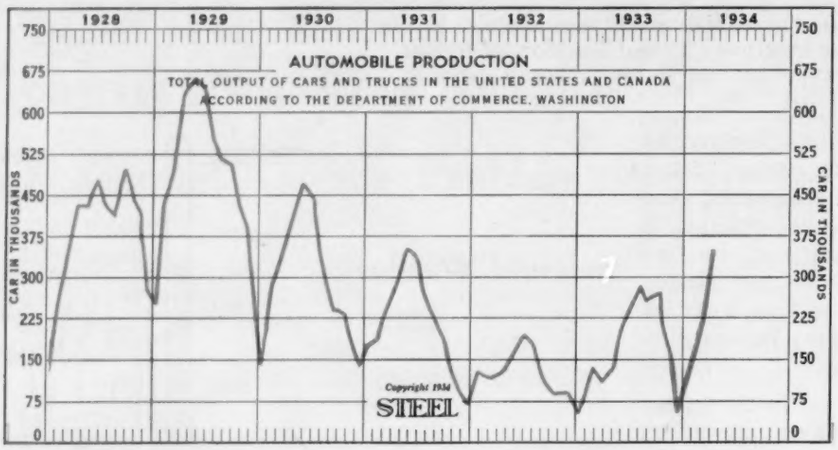
Financial Indicators

	Mar., 1934	Feb., 1934	Mar., 1933
25 Industrial stocks	$142.56	$148.33	$85.07
25 Rail stocks	$38.99	$41.02	$21.27
40 Bonds	$81.25	$80.59	$62.07
Bank clearings (000 omitted)	$19,598,162	$19,036,698	$16,449,678
Commercial paper rate N. Y. per cent)	1¼	1½	1½-4½
*Commercial loans (000 omitted)	$4,647,000	$4,665,000	.....
Federal Reserve ratio per cent	68.2	66.3	57.8
**Railroad earnings	$29,281,008	$30,931,205	$9,802,272
Stock sales, N. Y. stock exchange	29,915,969	56,834,010	20,088,664
Bond sales, par value	$319,673,300	$384,503,700	$192,156,206

*Leading member banks Federal Reserve System.
**February, January and February respectively.

Commodity Prices

	Mar., 1934	Feb., 1934	Mar., 1933	Monthly Av., 1913
STEEL's composite average of 14 iron and steel prices	$32.40	$32.42	$28.35	$26.32
Bradstreet's index	$9.16	$9.26	$6.53	$9.21
Wheat, cash (bushel)	$1.05	$1.07	72c	92c
Corn, cash (bushel)	65c	66c	43c	51c
Petroleum, crude (Bbl.)	98c	98c	42c	$2.50



March, 1934	350,173
February, 1934	243,955
March, 1933	124,634

resultant increased spending power of employes has gone into consumers' goods, as reflected in the gains in department store sales.

The entire transaction has had the effect of retarding the return of confidence among private investors. This, in conjunction with confusion in banking and in legislation affecting securities, has dried up the flow of capital into the durable goods industries. The situation is far beyond the power of PWA or other government financing to correct.

Therefore the next step in recovery must be an attitude in Washington which will be inducive to the free investment of private capital. From now on the pace of business improvement will be governed very largely by this single factor.

In the meantime, the trend of industrial activity continues upward. Should the oppressive hand of government be lifted soon enough, expenditures for needed capital goods might be authorized in time to partly offset the expected seasonal recession this summer.

Where Business Stands

Monthly Average, 1933—100

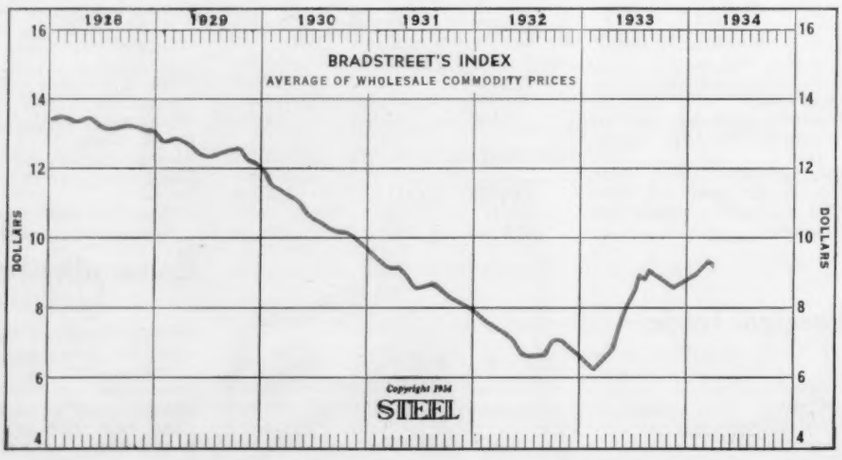
	March, 1934	Feb., 1934	March, 1933
Steel Ingot Output	140.4	125.6	45.7
Pig Iron Output	144.8	125.4	48.3
Freight Movement	109.8	103.6	82.7
Building Construction	120.7	66.7	80.7
Automobile Output	207.5	154.1	74.2
Wholesale Prices	116.5	117.8	83.1

March Automobile Output Points to Higher Levels

Automobile production in the United States and Canada increased sharply during March. The latest report from the department of commerce places the output of passenger cars and commercial motor vehicles at 350,173 units of which 14,180 were produced in Canada. In February production totaled 243,955 units.

Commodity Price Index Advances 40 Per Cent From Year Ago

Bradstreets' index of wholesale commodity prices on April 1 dropped to $9.16, a loss of 1 per cent from the preceding month. The latest index, however, shows an advance of 40 per cent over that of April, 1933, when it registered $6.53. With the exception of the index for March 1, the present figure is at the highest point since April 1, 1931, when it stood at $9.22.



	1934	1933
April 1	$9.16	$6.53
March 1	9.26	6.35
February 1	9.01	6.53
January 1	8.83	6.79

COMMERCIAL barrel plating installation, for electroplating small parts such as bolts and nuts. Operator is shown raising a barrel from the plating solution by means of an overhead electric hoist

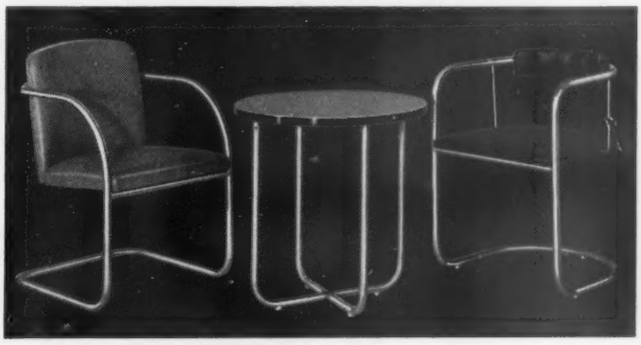
HOW EFFECTIVE IS A CADMIUM COATING?

BY J. S. HOFFMAN and L. J. GEORGE
Udylite Process Co., Detroit

USE of cadmium coatings as protection against corrosion on metals has progressed rapidly during the past 15 years until at present they find application on a wide range of products the world over. With protection against rust, cadmium combines an attractive silvery-white luster, reasonable cost and other properties such as ductility, ease of soldering, ability to resist alkalies and low contact resistance.

While protective properties of cadmium are generally known, they are not commonly understood. Most people believe that as long as a part is cadmium plated it is permanently immune to corrosive influences, but such reasoning is false. On a part which is exposed only to normal indoor corrosive attack, a thin deposit of cadmium suffices; where outdoor corrosion is to be encountered, an added thickness of plating will be required.

Extensive laboratory tests have shown that a coating of cadmium less than 0.0001-inch thick is full of microscopic pinholes and cracks through which the base metal is exposed. When the coating is 0.0002-inch thick, these defects are fairly well covered and a continuous film of protective metal is obtained which completely envelops the base metal and prevents access of corrosive media. The latter thickness is actually several times as rust resistant as 0.0001-inch thickness. Therefore, 0.0002-inch is the minimum thickness (except where parts are plated only to prevent rust in storage) of cadmium which should be specified.



Modernistic furniture with frame of cadmium plated steel tubing. Plating thickness is 0.0003-inch, slightly over the minimum satisfactory thickness for indoor exposure, to allow for subsequent scratch brushing of the finish

But this minimum thickness is not sufficient for parts subject to outdoor corrosion. Results of tests on the latter type of corrosion in various locations throughout the country have demonstrated that a minimum thickness of 0.0004-inch is required for satisfactory protection. This, of course, is the minimum limit; in some cases thicknesses up

to 0.0008-inch are necessary to combat severe exposure conditions.

A lustrous cadmium deposit protects more efficiently than a dull finish. The explanation is that bright plates are made up of fine-grained metallic crystals, essentially nonporous. On the other hand, dull plates, often porous and spongy, retain corrosive materials which ultimately reach the base metal. Bright plates also are harder, although cadmium coatings, at best, are rather soft.

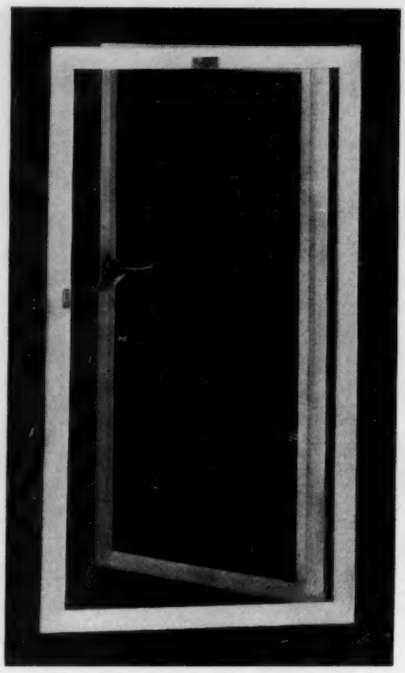
Unfortunately, appearance offers no clue to thickness which is, after all, the most important factor in determining the life of the protective coating. Thickness must be determined by a test which will function accurately under all conditions. Such a test has been developed and is now available to users of cadmium coatings.

Thickness Gaged Chemically

Before discussing the mechanics of the thickness determination, it might be well to point out the general theory behind the new test. It will be realized that a thickness of 0.0002-inch is too minute to be measured practically with instruments; hence it is accomplished chemically by dissolving the cadmium plate in a special solution and noting the time required for this dissolution. Essentially a simple test, it can be carried out in from 3 to 5 minutes by a person unskilled in the technique of chemical investigation.

It is well known that plated coatings are not evenly distributed. Sharp edges and protruding corners always receive a heavier plate than recessed portions (see the sketch on Page 25). While the cadmium bath has a superior throwing power, or ability to improve on the normal uneven plate distribution, the plate is never distributed absolutely evenly.

Uneven plate distribution also is caused by insufficient cleaning. Electrocleaners have a poor throwing power in that most of the gas evolution which facilitates grease removal is localized to protruding points. If the electrocleaning is interrupted when these points only are cleaned and grease remains in recesses, such greasy areas may not take any plate in the bath or start plating only after some time has elapsed and consequently take only a thin plate. Cleaning in organic solvents often solves this problem satisfactorily.



Cadmium plated steel window sash, subjected to severe exposure conditions, is given minimum coating thickness of 0.0006-inch. Before plating, the sash is sandblasted and acid pickled to insure thoroughly clean surface

Presence of grease also may prevent the acid pickle from removing scale and rust. Whether poor pickling is a result of poor cleaning or of insufficient time in the pickle, the presence of oxide on the surface will cause uneven plate distribution. The oxide may be covered by plate, but in any case its thickness is always less than the average thickness.

Earlier tests on coating thickness have been maximum or average thickness tests and have not shown the weak points of the plates, with the result that a definite indication of the value of the coating was not obtained. Later tests have been developed to show minimum thickness. The chemical or stripping test just mentioned gives this minimum thickness accurately, showing the actual thickness at any one point. For this reason it points the way to improved plating practice where such is needed.

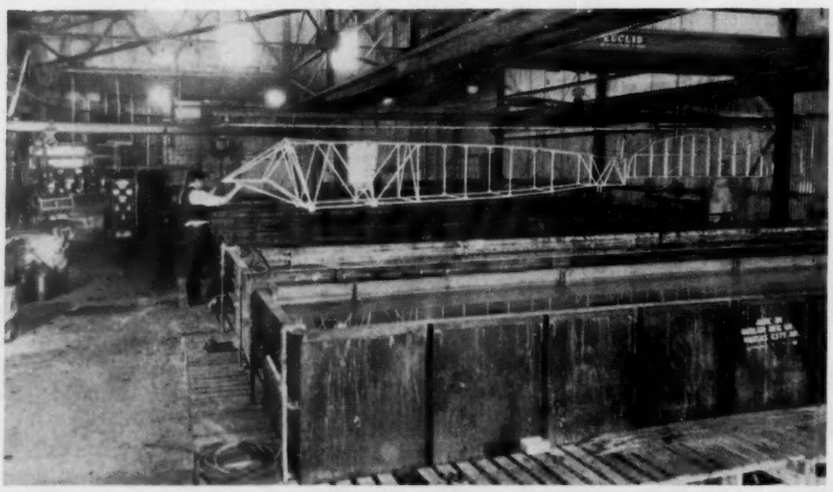
Thus, if the stripping test shows small individual areas of thin plate on an area with otherwise heavier thickness, it is certain that the cleaning practice can be improved. Further, if the recesses show a thin plate in comparison with the protruding points, the plater knows at once that his racking arrangement is not what it should be, or that his solution is incorrect.

An important feature of the new stripping test is that its action is independent of the presence of minute amounts of impurities in the plate. Such impurities shorten the test time in an earlier form of the strip test and indicate a smaller thickness than that which is present. Another advantage of the new procedure is that the action is independent of the nature of the base metal, older tests often being unreliable on cast iron.

Two Test Solutions Used

In the new test, two solutions are used, *A* and *B*. These are poured into two testing cups. The object to be tested is immersed in the cup containing *A* solution and held there for 15 seconds. It is then rinsed in water and inspected. If the entire surface is covered with a brown film, the minimum thickness of the plate is at least 0.00005-inch. The film is then removed by rinsing in the cup containing *B* solution, the specimen then rinsed in water and immersed for another 15 seconds in *A*. Inspection now shows whether the minimum thickness is greater than 0.0001-inch. This procedure is repeated until the base metal stands out against the brown film on the plate, which is the end-point. If, for example, the end-point is reached after five 15-second immersions, the minimum thickness of the plate is at least 4 x 0.00005-inch or 0.0002-inch.

If the base metal is brass it will not stand out very well against the brown film. It will, however, show plainly against the white plate after the object has been rinsed in the *B*



Equipment for still tank plating operations. Suspended over the plating tank in the background is the cadmium plated framework for an airplane fuselage

solution. Total time for testing each 0.00005-inch is about ½-minute, and a 0.0002-inch plate is tested in about 2½ minutes.

Consistent with the idea that no article or material should be purchased without certain limiting and qualifying specifications being made, the purchaser of protective coatings should constantly keep in mind the important part thickness plays in the performance of coatings. Buying of cadmium plating as such, without any reference or specification in regard to thickness, gives the job plater considerable leeway and undoubtedly is the explanation for the wide variations in job plating prices. It also accounts for the rusting of many parts which supposedly were plated to be rustproof.

Exposure Prime Consideration

Obviously the way to buy protection is to determine the type of exposure to which the product is to be subjected. As indicated previously, the minimum thickness for efficient protection indoors is 0.0002-inch; and outdoors a minimum of 0.0004-inch. These are facts which must be determined before the job plater even bids on the job. When they are determined, the plater has something to base his cost on and can quote accordingly.

It does not cost the plater as much to apply a "flash" cadmium coating without proper cleaning of the base metal, as it does to apply a standard thickness coating with suitable cleaning of the metal; and the former gives far less protection per dollar.

In conclusion, it should be borne in mind that thickness exerts the predominating influence on the efficiency of protective coatings of any type. Further, it should be remembered that the purchase of protective coatings should be governed by specific considerations peculiar to the buyer's needs.

Changes Dates for School On Porcelain Enameling

Dates for the training course for porcelain enamelers, to be conducted by the Ferro Enamel Corp., Cleveland, have been changed from May 3-5 to a time in July. The course is to be devoted to process control of porcelain enamel, although such subjects as common causes of trouble will be touched upon.

The instruction will be in charge of J. E. Hansen, author of the company's textbook "Advanced Technique of Porcelain Enameling." Round-table discussions will be held and enamelers from leading enamel plants throughout the country have been invited to attend and to direct these discussions.

Classes will be held in the company's factory offices located at 4150 East Fifty-sixth street. Enrollment is limited to 50 members and will be closed when this number is signed. A complete schedule of subjects to be discussed can be obtained by addressing the corporation.

Two solutions and test dishes used for chemical determination of thickness of cadmium plating

Refractory Standards To Be Recommended for Approval

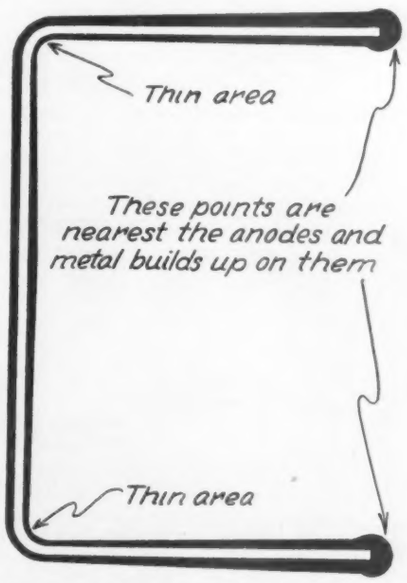
As a result of recent work of committee C-8 on refractories of the American Society for Testing Materials, new proposed specifications will be recommended for approval as tentative standards covering widely used refractory materials. Clay firebrick for use in incinerators is covered in one of the proposed standards, and ground fireclay in another.

Action was taken at a recent meeting of the committee to propose the adoption as standard of the tentative method of test for particle size of ground refractory materials. This method, also applicable to such finished products as fireclay mortars and high-temperature cements, first was published in 1932 for criticism and review.

The tentative method of control test for resistance of fireclay brick to thermal spalling action, often termed the "water dip spalling test," is to be withdrawn. The committee is considering other methods to determine resistance of refractory materials to thermal and structural spalling. The withdrawal of the definitions of terms relating to heat transmission of refractories also will be recommended. In place of these, the committee proposes the approval as tentative of the "Symbols for Heat Transmission" as approved by the American Standards association.

Some changes are to be proposed as tentative for inclusion in the standard methods of testing high-temperature heat insulation from the standpoint of compression, flexure and shrinkage.

Several studies and research projects are being carried on by the committee. The investigation on methods for determining thermal conductivity of refractory materials is to be continued; a panel spalling test is being studied; and work is contemplated on load tests of heavy-duty firebrick at temperatures higher than those now specified in the standard test.



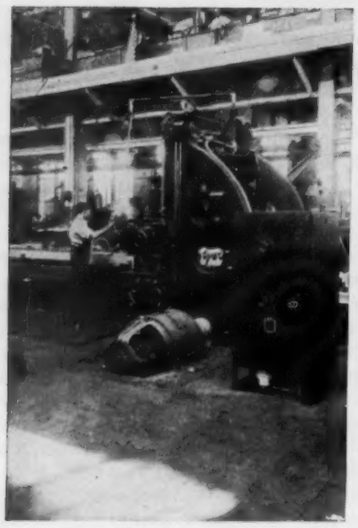
Exaggerated sketch showing cross section of electroplated cup-shaped object, black portion being the plated metal. Note uneven distribution of plate and consequent difficulty of determining "average" thickness

Shop Treatment Is Guide in Choosing Locomotive Steels

Seeking to answer the question as to why locomotive builders stick so close to common iron and low-carbon steel, and are slow to replace massive parts with special alloys, Frederick H. Williams, assistant test engineer, Canadian National Railways, Montreal, sets forth some interesting viewpoints in the April issue of *Metal Progress*. He states that it must be recognized constantly that the most perfect steel ever produced will not of itself give ideal results when applied to railroad rolling stock, engines particularly. In other words the treatment and mistreatment it gets in shop and service is the ruling consideration.

Further, the full value of ordinary steels frequently has not been obtained when the railroad man has rushed to the more expensive special steels, only to find himself in no way better off—often worse. Study of the causes of failure of ordinary steels emphasizes the belief that, under like conditions, special steels would have failed as readily. Corrosion, heat treatment, chemical content, mechanical work and machining all have their effects on the service value of any grade of steel.

Making the Most *of* METHODS AND MATERIALS



Strip Steel Contact Stop Bar Controls Textile Loom

A CONTACT stop bar, two pieces of tinned cold strip steel about 1 inch wide and $\frac{1}{16}$-inch thick rolled to 0.001-inch accuracy, stops a large textile loom instantly when a broken unwoven thread releases the heddle wire through which the thread passes. This bar, running the weaving length of the loom, is rigid and grooved on both sides, one end of the bar being grounded. The two pieces of strip steel sandwich an insulating material, lexide. When the thread is broken at any point in the weaving area, the wire heddle holding that thread is released and drops onto the contact bar. The drop wire, which is notched at the top contacting the ridges and grooves causes an electric current in the bar which immediately brings the loom to an automatic stop, making it possible to tie the broken thread and resume operations with a but a moment's delay.

Spent Cyanide Put in Cupola

One English firm having considerable spent cyanide from its steel heat treatment pots found that it gave good results as a fluxing agent in the cupola. The amount used could not be over 10 per cent as beyond that point severe attack on the lining ensued. It is said that application of the spent cyanide resulted in the graphite being finely divided, a close texture iron, and increased mechanical properties.

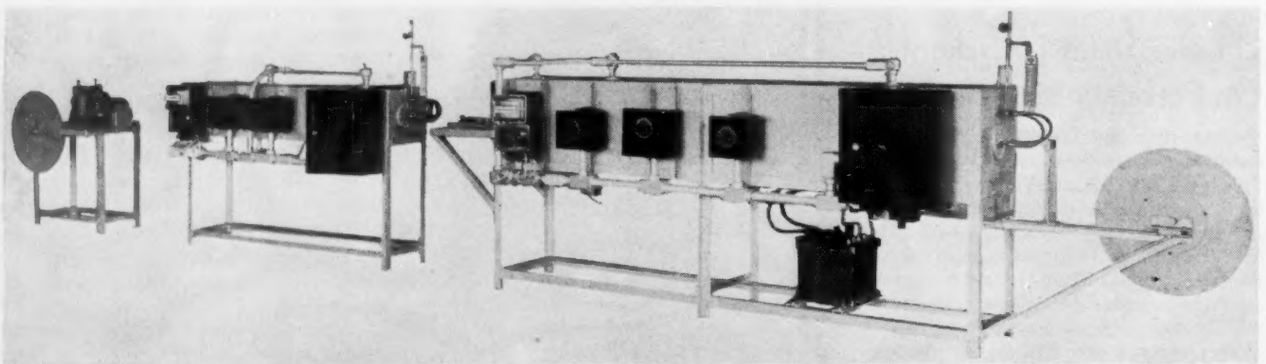
Demonstrate Accuracy of Flame Cutting Plates

Experiments have been made to ascertain what precision could be obtained in oxyacetylene machine cutting. In a laboratory specimen of plate 1¼ inch thick and 15 inches long, the variations in the cut surface were 0.008 inch in a lengthwise direction and 0.002 inch crosswise. In another case, a cut specimen was requested exactly 3.50 inch wide. It was produced 3.495 inch wide. In other experiments, it was found that the edge would remain straight and smooth when as little as 1/16 inch was removed by the flame. Such work can be done when the metal to be cut and the cutting blowpipe are mounted on a sufficiently precise apparatus. These are the present precision limits to oxyacetylene cutting and are not to be construed as practical for commercial tolerances in production cutting.

\$ \$ \$

Greater Strength in New Aluminum Casting Alloy

An aluminum casting alloy, which is said to be particularly applicable for fast moving levers, treadles and brackets for the textile and electrical industries, has been developed in England. It contains 2.5 per cent copper, 1.5 per cent nickel, 0.8 per cent magnesium, 1.2 per cent iron, 1.2 per cent silicon, and the remainder aluminum. As cast, the alloy has a tensile strength of about 27,000 pounds per square inch, 1.5 per cent elongation and a brinell hardness of 80. Solution heat treated, the strength increases to 38,000 pounds per square inch, elongation to 3.5 per cent and brinell hardness to 110. With a solution heat treatment and aging, the strength is 47,000 pounds



HARDENING AND TEMPERING 100,000 RAZOR BLADES DAILY: This Falcon-type electric furnace, designed for continuous heat treatment of razor blade stock, has been installed in the East by a Canadian manufacturer. H. O. Swoboda Inc., Pittsburgh, is manufacturer of the equipment. Material is fed automatically from the takeoff reel at the right, through a single chrome-nickel steel tubing in the 9-foot hardening furnace. Heat is supplied by resistors mounted above and below the tubing in porcelain blocks. The furnace is provided with three-point pyrometric control and an attachment for maintaining a neutral gas atmosphere. Leaving the hardening furnace, the stock is quenched by passing between polished plates of hard steel, cooled by water or brine, and continues on into the tempering furnace, 6 feet in length and also with controlled atmosphere. Emerging from the tempering furnace, stock is wound on the receiving reel at the extreme left. Production is at the rate of 100,000 blades per 9-hour day

per square inch, elongation 1 per cent and brinell hardness 129.

$ $ $

Hardfacing Used on Valves In High-Pressure Lines

Among the most promising of recent stellite developments is the application of this abrasion and corrosion-resistant alloy to gate and globe valves for high-pressure, high-temperature steam. Facings of the material are applied to seat rings and disks by the oxyacetylene blowpipe, such surfaces combining excellent stainless qualities with exceptional hardness. Seat rings and disks hard faced with stellite are resistant to wear and also are sufficiently tough and corrosion resistant to withstand "wire drawing."

$ $ $

Alloy Cast Iron Shows Long Wear in Stamping Dies

A high-grade nickel-chromium cast iron developed by a midwestern foundry for sheet metal fabricating dies is demonstrating its ability to withstand severe service. A shop record of one die in operation 24 hours a day cold stamping automobile truck body standards from 0.10-inch steel and turning out approximately 10,000 pieces per day, shows that although more than a million pieces have been produced, the die still is in operation. This plant uses more than 600 dies made from this alloy, these ranging in weight from 25 pounds to 1 ton.

$ $ $

Pickling Before Galvanizing

Previous to galvanizing, gray iron castings usually are pickled in a mixture of half muriatic (hydrochloric) acid and water, and then are dried without rinsing. As soon as they are dried, they are galvanized. If any considerable time is allowed to elapse between drying and galvanizing, there is a tendency of the castings to rust. The muriatic acid pickle aids in producing a good coating of zinc on the casting.

$ $ $

A machinery manufacturer changed from a gray to a bright red insulating paint on the castings which form a milling machine body. Comparisons of rough cutting and finishing operations showed that the machine hands were doing better work after the color change was made.

$ $ $

Brick machine wear plates of alloy cast iron containing 2.00 per cent nickel and 0.75 per cent chromium have delivered 150,000 bricks and still are in commission. The maximum with plain gray iron was 50,000 bricks.

Illustrations courtesy Federal Electric Co., Chicago

Nearly 364 tons of steel, including 330 tons of structurals and 33 tons of enameling sheets, was required in building this spectacular electric sign on the northeast corner of Randolph and Michigan, Chicago

More Steel Is Required for Electric Display Signs

RECENT developments in the design and manufacture of electric display signs are expanding a market which, for many years, has been an important small outlet for various steel products. From the earliest days steel has been the accepted material for the making of signs, whether they were the modest announcement over the entrance of a small shop or the huge displays that light the skies of large metropolitan centers. Introduction of the electric light and more recently the neon tube, coupled with the development of widespread advertising by large industries and the growth of advertising acceptance by retail stores, have served to increase the consumption of steel in this field.

Two other factors recently have contributed to an expansion in electric sign installations. One is the rising popularity of the large spectaculars—signs usually erected on framework and designed to be viewed over wide areas. The other is co-operation between national advertisers and retail stores in the installation of signs advertising the location of the latter as well as the product of the former.

The potential market for installation of spectaculars is broad, larger cities being the logical centers for development, and the increased activity in this field in certain cities during the past several years when advertising generally was declining tends to indicate further growth. On Chicago's lake front $2,000,000 has been spent the past four years in the erection of electric spectaculars, giving that city a skyline of signs which rivals New York's great white way.

Aim for Day Readability

While spectaculars have been employed for many years, in numerous instances they were designed only for attention when lighted and when viewed in daylight the signs are undecipherable. Newer designs, however, take into consideration the advertising value of readability during the day as well as night. Brightly colored enameled steel sheets help to give the display a day-time effectiveness which, while perhaps less forceful than that obtained when lighted, increases its value as an advertising medium.

Spectaculars consist essentially of outlined words or other subject matter mounted on a framework. Depending on the size and type of sign, steel requirements for the building of a spectacular range up to several hundred tons, principally sheets and structural material. Although frequently mounted on top of build-

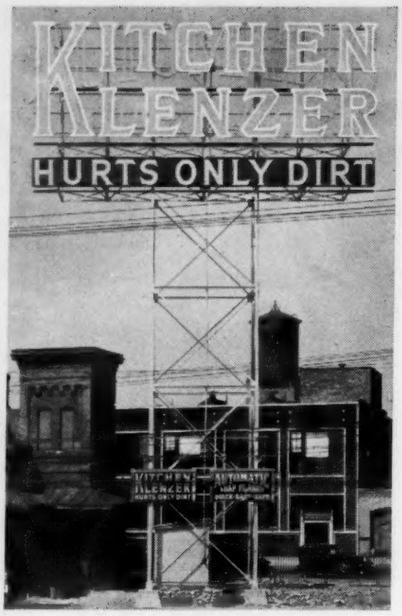
ings, some spectaculars employ an individual support of structural shapes located on the ground.

A spectacular completed recently at Chicago for the Chevrolet Motor Co., typical of the larger installations of this sort, required 330 tons of structural steel for the sign framework which is erected on four concrete and pile foundations. A preview of this sign is shown in an accompanying illustration. The display proper, measuring from 140 to 288 feet above the ground, is made up principally of a circular revolving and color-changing background of lamps, a clock, trademark and a motograph. Lettering and other decorative parts are fabricated of 18 and 20-gage enameling sheets, the display requiring 33½ tons of this material. The various sections are bolted to the framework and may be changed if desired. Framework is of riveted construction.

Miles of Wire and Tubing

This display, built by the Federal Electric Co., Chicago, employs 17,240 electric light sockets, 1100 feet of neon tubing and 21 miles of wire and cable. The connected electric load for the display is 445 kilowatts. Clock hands, 27 feet long and weighing 1000 pounds each, are made of aluminum alloy sheets, with cast aluminum sections used for the hubs and for reinforcing purposes. A permanent elevator provides access for workers.

Dealer signs, used by retail stores, are manufactured principally from sheets and angles. Although considerably smaller than the spectaculars, the dealer signs are more numerous and have a broader market. A survey made by the New York Edison Co. several years ago of electric sign installations in New York revealed that there were more than 23,000 in use from the Battery to 135th street. While the market for signs in some of the larger cities frequently gives the appearance of approaching saturation, the replacement of old units provides a substantial backlog for business, and a large potential demand remains in smaller centers.



Some electric signs employ individual support. This sign has as its support a structural tower resting on four concrete piers

Another market with possibilities for future development is factory signs. Such signs, advertising the name or product of the tenant, are increasing in number, and are expected to become an important factor in expanding installations.

Commercial Heating, Cooling System Uses Coal

A commercial heating and refrigerating plant using anthracite coal has been placed in operation in a large warehouse for storage of meats and provisions in Pottsville, Pa. The plant is a development of the Pottsville laboratories of the Philadelphia & Reading Coal & Iron Co.

The unit includes an absorption refrigerating machine utilizing steam generated in a special furnace burning anthracite coal. The furnace was developed last year by the company's laboratories and is characterized by its high efficiency. Originally designed for domestic use in air conditioning and heating, it has been further adapted for commercial use.

A large meat storage room, 30 x 60 feet in size and 11½ feet high, with capacity for four or five carloads of meat at a time, will be air conditioned by the refrigeration plant operating a cold diffuser, said to be a radical departure from conventional methods of refrigeration. The entire installation has virtually no moving parts, circulation being maintained by a small pump operated by a 1/3-horsepower motor. Equipment is claimed to be compact and practically noiseless. Provision has been made for heating the building in the winter, as well as for supplying hot water.

HERE is shown a large spectacular electric sign erected on the top of a building, according to common practice. Light structural shapes constitute the framework

Thermodynamics of Electric Phenomena in Metals

The Thermodynamics of Electrical Phenomena in Metals, by P. W. Bridgeman, cloth, 200 pages 6 x 8¾ inches, published by the Macmillan Co., New York, and supplied by STEEL, Cleveland, for $3.75 plus 15 cents postage; in Europe by the Penton Publishing Co. Ltd., Caxton House, Westminster, London.

Much more extensive use than is generally realized may be made of the broad principles of thermodynamics in discussing electrical properties of metals. This book attempts a more or less systematic application of classical thermodynamics to those electrical phenomena amenable to thermodynamic treatment. In laying the basis for the thermodynamic attack a re-examination of electrical concepts is necessary, and it is found that the classical concepts are not broad enough to cover completely the domain of experiment. Thermodynamic argument then shows a number of necessary relations, not generally known, between various electrical effects.

The author has been on the Harvard university faculty for 25 years and is the author of "The Logic of Modern Physics" and "The Physics of High Pressure."

Special Slide Rule Designs

Design of a number of types of special slide rules is discussed in detail by J. B. Arnold, instructor in engineering drawing, Purdue universi-

ty, Lafayette, Ind., in Engineering Bulletin, vol. XVII, No. 5, recently released by the engineering extension department of the university.

Foundrymen Talk Shop Problems

TECHNICAL and practical problems relating to the melting of iron featured the second annual short course in foundry work conducted by the mechanical engineering department of Michigan State College of Agriculture and Applied Science at East Lansing, Mich., April 19 to 21, in co-operation with the Detroit Foundrymen's association. The program was prepared under the direction of Prof. Frederick G. Sefing, of Michigan State college.

At the opening session Thursday morning, April 19, Frank G. Steinebach, managing editor, *The Foundry*, Cleveland, spoke on "the Development of Melting Cast Iron," tracing briefly the early history of the foundry industry and outlining some of the more important developments in the art of melting which have had considerable influence over the design of melting equipment.

Three papers were presented at the Thursday afternoon session under the chairmanship of Jesse D. Stoddard, Detroit Testing Laboratory, Detroit. John Grennan, University of Michigan, Ann Arbor, Mich., in a paper on "Cupola Design" discussed the variables of construction which influence operation. He pointed out that no research has been completed to establish definitely the height of the charging door; that the single row of tuyeres probably is the most popular, and also indicated the features of tuyere design in the balanced blast cupola developed in England.

Cites Refractory Demands

R. E. Aptekar, consulting engineer, Ypsilanti, Mich., in a paper on "Refractories" described the various zones in the cupola and discussed the properties required by the refractories in each zone. He stated that physical rather than chemical properties are of most importance in many instances, and discussed the composition diagram of alumina and silica to show the most desirable composition for cupola use.

A paper on "Slags," read by Fred J. Walls, Eaton-Erb Foundry Co., Vassar, Mich., stated that in making a cupola charge it is important to create a slag which has as low a fusion point as is consistent with conditions present, and at the same time is in a quantity sufficiently large for cupola operation control, to cover well the bath of molten iron in the hearth and to act as a secondary cleanser for the molten iron passing through it.

H. V. Crawford, General Electric Co., Schenectady, N. Y., presented a paper on "The Air and Gases in the Cupola" at the Friday morning session, with Henry Lane as chairman. Mr. Crawford stressed the importance of air as a material in cupola operation and stated that after the cupola has been charged, air is the only controllable variable which will affect the iron materially.

The afternoon session, with Harry Rayner, Dodge Bros. Inc., Detroit, as chairman, took the form of a round table discussion under the leadership of Fred J. Walls. Presenting a discussion of linings for cupolas in continuous operation, Mr. Walls stated that he did not consider it advisable to patch over partly burned brick but believed it necessary that such bricks be replaced. It was suggested that in figuring the heat produced in the cupola, consideration should be given to the heat secured through the oxidation of silicon and manganese in the iron.

It was stated that bundled scrap, which is being used by many foundries in the Detroit district, probably should be made up in bundles not exceeding 100 pounds to secure the best results in the cupola. Ordinary molding sand which is fairly open was favored by many for the cupola bottom.

Charles Morrison, Saginaw Malleable Iron division, General Motors Corp., Saginaw, Mich., presented a paper on "Electric Furnace and Duplexing" at the Friday evening session, at which Glenn Coley, metallurgist, Detroit Edison Co., presided.

A paper on "Special Cast Iron Alloys," by R. G. McElwee, general manager, D. J. Ryan Foundry Co., Ecorse, Mich., described the practice employed in producing several different types of alloyed cast irons, including a modified malleable. The latter has an approximate composition of total carbon 2.40 per cent; silicon 1.30 to 1.60 per cent, depending on the sections; manganese 0.35 per cent; and sulphur and phosphorus as low as possible.

Saturday morning, Carl Joseph, metallurgist, Saginaw Malleable Iron division, General Motors Corp., Saginaw, presented an interesting paper on "Cupola Control."

Looking to the Future

Harry W. Dietert, chief engineer, U. S. Radiator Corp., Detroit, in a paper "What the Future Holds for the Cast Iron Industry," predicted that the industry today is securing an ever broadening field for its products. Recent developments include production of exceptionally high strength irons, increase in corrosion resisting properties, development of irons to meet high temperatures, collection and dissemination of technical data on gray iron, application of modern merchandising methods and introduction of one part casting construction.

The Detroit Foundrymen's association held its regular monthly meeting on Thursday night of the course, with Fred J. Walls, president, presiding. Officers were elected as follows: President, Harry Rayner, Dodge Bros; vice president, Vaughn Reid, City Pattern Works; secretary, Harry J. Deutsch, Aluminum Co. of America; member of the executive board, Ira F. Cheney, Griffin Wheel Co.; A. F. A. representative, Jesse D. Stoddard, Detroit Testing Laboratory.

All-Steel Folding Chair Is Made in Various Designs

THIS all-steel folding chair, suitable for both indoor and outdoor use, is one of several types now being manufactured by the Lyon Metal Products Inc., Aurora, Ill. Frame is of special channel section; seat and back are of sheet steel, stamped to resemble cane. Four styles are made: Straight seat; straight seat with arms; curved seat (illustrated); and curved seat with

arms. Each style is made in three types: Upholstered; steel cane; and with wood seat and plain steel back. Weights range from 10 to 12 pounds. Four standard baked enamel colors are offered: Black; flat mahogany; flat walnut; and dark green. The chair is 15¼ inches wide, 17 inches high from floor to top of seat in front, and 31 inches high overall when open.

Removing cast steel risers with the gas torch—an operation that is related to one welding procedure

RELATIONSHIP OF THE WELDING ART TO THE STEEL CASTING

BY R. A. BULL*

IT SEEMS desirable to point out the extremely interesting relationship that exists between welding and steel founding. It should not be difficult to show that, broadly speaking, these branches of industry, are complementary rather than antagonistic to each other. Fortunately those who produce steel by depositing it under the gas flame or under the electric arc, and those who pour it into the sand mold for taking permanent shape as a component of a machine or structure, can co-operate with great mutual advantage.

Undoubtedly there are and always will be numerous cases where co-operation must yield to competition. The welding engineer and the steel foundryman are learning to be good sportsmen in these respects. They are gradually developing a sound merchandising philosophy, based on the realization that every industrial metal is good material, if and when used where it belongs economically.

Welding as applied to steel castings must be considered from two different but related points of view. The most important adaptation of fusion welding to the product of the steel foundry lies in what generally is called repair work, for the partial or complete elimination of observable defects in the product as cast; and subsequently (in a very small minority of cases) in the casting as it may become damaged in service. The other aspect of the matter lies in commercial fabrication by means of which steel castings are joined to wrought steel parts, when this represents economical construction. It is important to keep in mind that such construction is steadily advancing, and that there are possibilities for it beyond anything yet accomplished.

When severe stresses are to be applied in service, the practicability of fusion fabrication of the kind mentioned depends chiefly on the metallurgical opportunities for doing repair work of the effective kind desired by the conscientious steel foundryman. In the cases of anticipated high stress involving impact and/or fatigue, the extent to which the characteristics of weld metal may be similar to those in wrought or cast metal should be the determining factor in deciding to weld or not to weld. This applies always for fabricating, also for "doctoring" an important casting member.

The problem of obtaining properties comparable to those in steel castings has become more complex with every year. The result of changes that have occurred since the world war began, in available melting equipment, in attention given to heat treatment, in the point of view of the consumer, and in the attitude of the steel founder, is now evidenced by a vast number of alloy cast steels produced more or less regularly. These provide the consumer with *almost* anything he may wish in the combination of resistance to tension, compression, and shearing stresses, applied statically, repeatedly, or by impact.

It is this condition of complexity in alloy steel production which places on welding experts a share of the heavy responsibility that should be jointly carried. This statement applies with regard not only to castings but to rolled and forged material.

Wisely, far-sighted welding engineers have devoted much thought to

*Consultant on Steel Castings, 541 Diversey Parkway, Chicago.

improved design for parts that might be produced by fusion fabrication and have been previously manufactured in forge shops, in structural plants where rivets are driven, and in foundries. The possibility of supplanting many a part in a machine or structure has depended on simplification of design for adaptation to welding. When all is said and done, the resistance of the ordinary component of the kind usually made in a well regulated shop for a machine or structure depends chiefly on the properties in one or more portions of the part where there is appreciable change of direction of the metal. Whether the part be rolled, forged, cast, or welded, in most applications it is the corner or joint that represents the potentially vulnerable location.

When a part is formed by joining pieces of metal under the gas flame or the arc, necessarily in the majority of cases the fusion occurs actually at, or close to a change of direction, as in an angular or curved portion of the finished piece. The ability of the welding engineer to develop satisfactorily high combinations of physical properties will depend on the welder's ability to closely approach in the new metal that has been deposited in a critical location, not only the best engineering conditions of filleting design, but properties fairly comparable to those existing in the parent metal. Probably in many cases the ability of this weld metal to stand up satisfactorily in service depends not so much on ultimate strength as on yield point, impact resistance, and endurance as related to repeated stress. In some applications resistance to heat and to corrosion are also highly important factors.

More Variety in Cast Metals

The condition indicated as applying to the steel foundry is paralleled to large extent when the welder considers his future opportunities for supplanting other metal parts than those formed in molding sand. However, the diversification in special steels in single plants is considerably greater, on the average, in the steel foundry than in the steel mill. This is due mainly to the extensive present use of small electric melting furnaces in casting plants. The ability of the welder in his own plant or elsewhere to develop physical properties in weld metal fairly comparable to those in cast metal is confined to small minority of the existing special grades of cast steel. The inherent excellent properties in most alloy steels are developed only by closely regulated, skillfully selected heat treatments. Great differences in physical properties in individual grades of alloy steel are obtained by varied heat treating procedures. The high temperature caused by fusion welding must be followed by scientifically chosen heating and cooling cycles, to secure the inherent maximum resistance to stress, wear, heat, corrosion, etc., comparable to the prevailing (or obtainable) resistance in the base material. It would seem therefore that fusion welding on alloy steels must be largely restricted to such parts as can be skillfully heat treated after welding.

Removing a slight defect on a cast steel center plate by electric welding

Some persons might think that the challenge of light weight combined with great stress resistance in structures unadapted for heat treatment presents no important commercial problem for welding engineers. The engineering significance of the matter is evidenced by the recent partial reconstruction of the Smithfield street bridge in Pittsburgh. This was done, not by using light weight parts of alloy steel, but by applying structural beams, stringers, and flooring units made of aluminum alloys, with a reported saving of 750 tons of dead weight, while adding the desired strength.

Rolling stock presents an interesting example of parts that occasionally are bent or broken as the result of wrecks causing stresses beyond the ability of any metal to withstand. Not infrequently, when a derailment occurs, some wrought and cast steel parts are distorted. When made of carbon steel they are not only readily capable of being straightened in anyone of the many repair shops along the line, but they usually possess a degree of stress resistance after blacksmithing which is fairly comparable to that previously characterizing the material. Carbon steel is not "temperamental," and will stand considerable heat-abuse. But quite a number of grades of alloy steel would be entirely unsuitable as vital parts for rolling stock, if put back into service after being straightened by a blacksmith, without subsequent heat treatment.

This condition, illustrating a current need for railroad equipment in respect to the choice of alloy steels for wrought and cast parts of high resistance and light weight, will indicate to welders that their problem involved in the need for heat treatment that cannot be given in the case of large structures is somewhat similar to a problem involved in the future adaptation of alloy cast and wrought steel to rolling stock. But there is this significant difference: The distorted cast or rolled piece of alloy steel taken from a car or locomotive that has been wrecked can be sent where it may be heat treated, or can be put on the scrap pile. It does not have to be used in its temporarily deteriorated condition. In contrast, the member welded into place on a bridge or building must go into service in the condition developed during fusion.

From what has been explained it would seem that some important factors in the future advisable use of welding fabrication may justify welding experts in co-operating closely with metallurgists in the attempt to originate chemical compositions of a somewhat peculiar kind, possessing impressive, permanent stress resistance when quickly air-cooled from the molten state. The characteristic behavior of alloy steels, considered collectively, is such as to make this particular problem one of extraordinary difficulty.

Soundness of Cast and Weld Metal

The observations that have been made are to be considered apart from others than might be offered in respect to comparable solidity. And with reference to that factor, it may be stated frankly that in the past some exaggerated statements have been made by welding enthusiasts, indicating the probable existence of many shrinkage and gaseous cavities in typical steel castings. The circumstances attending the formation of the material prompts the logical surmise that the total volume of perfectly solid metal in cast steel, proportionately, is greater than the total volume of homogeneous material in weld metal. The part produced in the foundry is made by depositing metal in one pouring operation, under conditions that safeguard against the pocketing of gas, the admixture of slag, and certain other possible causes of inferiority. Weld metal usually consists of layers, each actually being a thin casting formed under relatively difficult conditions of control. Certainly the human element is as great a factor in making the average welded joint as in making the typical sand casting. When analysis of the influencing conditions is made without prejudice, there is no basis for disparaging the steel casting as compared with the welding, considering the probable nature of the average product.

None of these comments is made

for the purpose of minimizing the highly significant progress made in fusion fabrication. Rather the object is to point out some aspects of a construction problem that have commercial significance for welders and founders. Far-sighted men in both groups might accomplish much good for each other, in trying to develop what may be metallurgically possible, while recognizing past achievements for what they are, as shown by unprejudiced analysis of typical results. Some of the potential benefits:

1. More satisfactory repairing of alloy steel castings having relatively slight surface defects.

2. Extension of foundry salvaging practice, to include the safe and more frequent use of welding for economically reducing percentages of scrap, due to serious defects discovered in the foundry, when making castings of alloy steel and of common steel having moderate or high carbon content.

3. More promising future adaptation of welding for joining cast steel and rolled steel parts of special compositions, for use in machines and structures where mechanical engineers will demand extraordinary resistance to stresses and light weights.

Gas welding a surface blemish on a small steel casting

In an article appearing recently in a journal devoted to the welding industry, it was predicted that some day skyscrapers will be constructed with walls not more than 3 inches thick, with dead weights reduced approximately to one-third of present weights. It was declared that welding will have a major part in such projects and that this dream might be realized within a year or two, resulting in huge savings. For the general economic good of all of us, it is to be hoped that many prophecies regarding conservation of materials, including those used for building machines and structures, will be realized, at least in large degree. But much work remains to be done before the achievements suggested can be placed to the credit of metallurgists and engineers. This matter of weight reduction is one of serious consequence.

Is it unreasonable to suppose that fusion fabrication as a means of construction, will be handicapped in the future if the welding art does not advance sufficiently to overcome many present difficulties incidental to medium carbon content, to contained elements that are oxidizable, and to combinations of elements that require heat treatment for the prevention of brittleness in the as-cast condition? It is to be remembered both by foundrymen and welders that the rapidly advancing state of the art employed in casting metals permits the successful manufacture of intricate castings, including very small cross-sections, which would not have been feasible many years ago. Looking forward, it would appear that the welding art, in order to hold its own within the field of fusion fabrication justifies intensive consideration by those who have thus far accomplished a great deal for industry in devising equipment and developing technique for welding.

Stiffness Is Important Property

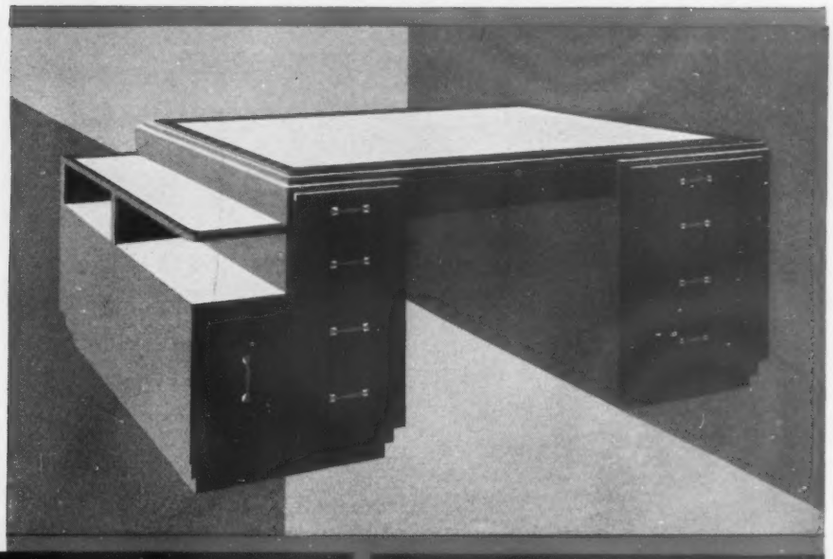
Apparently there is a middle ground on which designers should stand in their efforts to eliminate surplus weight. Admitting as we may, that probably many thousands of tons of metal have been wasted in providing unnecessary thicknesses of members in wrought and cast material, it cannot be denied that a very useful function is performed by mere mass, for each of many purposes. It is possible that some engineers may go too far in lightening structures and machines, and ultimately acquire by experience an improved sense of proportion in this respect. Generally speaking, the stiffness of a member is influenced in considerable degree by its cross-sectional dimensions. For many purposes it is required not merely that a member shall resist distortion or fracture, but that it shall keep in alignment; in other words, shall not yield temporarily and visibly to such forces as may be applied within safe limits, in respect to the material's elastic properties.

The steel casting has its peculiarities. One of these is largely the result of its typical granular structure, and provides the maximum degree of stiffness (manifested under transverse loading) which accompanies the characteristic combination of properties determined by testing a given grade of steel under tension. Unquestionably this stiffness, when associated with good resistance to impact and fatigue, is a desirable quality for many uses. A metal part may have admirable resistance to distortion or permanent deformation, and yet be unsuitable in composition, sectional dimension, etc., for a given purpose—purely because of its tendency to temporarily yield under certain stresses.

Leading to New Uses

It would be unjustifiable to suggest that welding engineers as a class may be losing sight of the fact that ordinary commercial steel loses stiffness that is needed for many purposes, as the carbon content is lowered. On the other hand it is reasonable to assume that this matter of rigidity, accompanying desirable strength and ductility, is being kept in mind, as justifying experiments that might result in suitable adaptations of weldings for purposes that are now outside the preferred field of fusion fabrication for some structures. Industrialists generally know that special steels having many times the strength and toughness of ordinary steel now are obtainable readily from foundry, forge shop, and rolling mill. Many engineers realize the potential advantages in using a type of construction that represents a compromise, by welding simple rolled shapes to intricate, cast members. Some such men will use more weldings if and when the product offers greater variety in the properties of the deposited metal.

During the last few years some extremely interesting examples of composite construction have been observed, furnishing the most economical method of making certain equipment parts. The writer has seen striking illustrations in the steel foundry, where equipment has been installed for the commercial production of composite pieces formed from castings produced within the plant and wrought material made elsewhere. It is to the credit of welders and founders that some such work, including alloy steel, cast and wrought, has successfully been done as the result of hearty co-operation between two groups of technologists.



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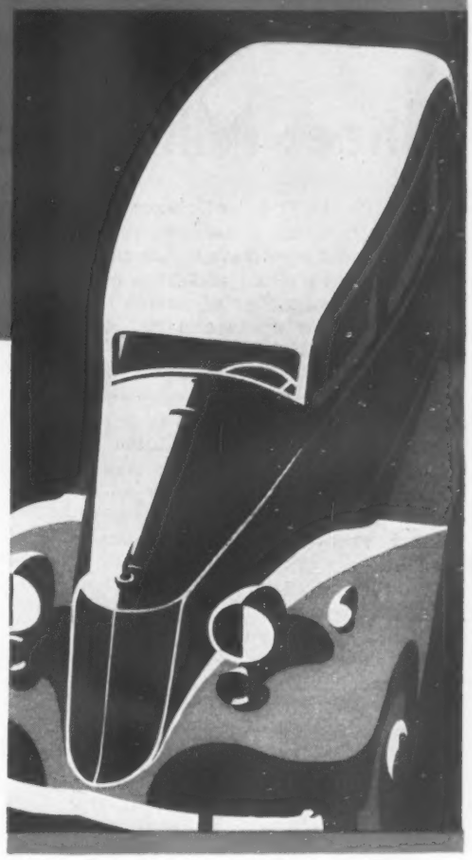

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Ten-stand, 4-high, 76-inch plate-sheet mill looking toward the front end. Six finishing stands are shown in the foreground

Sheet Mill Mechanization Increases Output

BY F. L. ESTEP
Perin Engineering Co., Inc.

Rolling sheets to various sizes and gages on conventional type sheet mills with and without mechanical feeders and catchers, and on 4-high mills of the continuous type was explained at a recent meeting of the iron and steel division of the American Society of Mechanical Engineers, New York, by F. L. Estep, vice president, Perin Engineering Co. Inc., New York. The accompanying article is abstracted from Mr. Estep's paper

MANUFACTURE of sheets ordinarily is done by rolling heated steel bars either singly or in pairs in a stand of 2-high rolls. After a given number of passes they are reheated in packs and rolled to the final gage and length.

This still is a difficult and laborious hand operation and requires a considerable amount of skill on the part of two or three individuals per mill per shift to obtain best results. This particular skill can only be acquired by experience, some men attaining greater aptitude or knack than others. The highest degree of skill is required of the roller, the next in importance being the heater. The third degree is that of the doubler when rolling thin sheets. All packs are handled by hand and the tonnage per mill per shift is comparatively low.

How Sheets Are Rolled

Usually the mill consists of two stands of rolls, known as the roughing and finishing stands. The bars first are given one or two passes on the roughing mill to help remove the scale from the surface. The rolls of the roughing or "soft" mill, as it frequently is called, are kept cool by water running upon them. The rest of the roughing as well as all the further rolling operations are done on the finishing mill.

In the old days the success of a sheet mill depended upon another individual, the "roll turner." He inherited his knowledge from his father and handed it on down to his son, and there existed great secrecy in the profession. They had learned by experience how to turn a pair of rolls for the results desired, and without the roll turner the plant could not operate and make either tonnage or quality. The practice of roll turning practically has become obsolete due to the development of machines for grinding the rolls to an absolutely accurate and predetermined convex or concave contour.

Until comparatively recently in this country the old type of hand mills previously mentioned were in existence and in full operation when the demand for sheets warranted their running at capacity. They employed a large number of men who received high wages, particularly the roller, heater and doubler. In practically all such mills there was an extremely large amount of man-handling of materials throughout.

When automobile manufacturers began to demand sheets to increasingly severe specifications regarding deep stamping qualities and surface, certain of the old type mills were modified to produce sheets of a quality and finish suitable for the automobile trade. The increase in the automotive industry called for a further increase in tonnage of sheets to even more severe specifications.

This required additional expenditures in the plants for various equipment which previously had not been needed for ordinary grade sheets. These included normalizing furnaces; better and cleaner methods of pickling; scrubbing and drying machines; roller levelers, hydraulic stretchers, and all manner of apparatus. In addition to the expenditure involved, there was also a marked increase in labor per ton due to the increase in the number of operations required from bars to finished sheets and the necessary number of men required for the additional handling.

Cost of Plants Varies

Up to 15 years or so ago a complete new sheet mill to produce annually 50,000 to 60,000 tons of black galvanized sheets of ordinary qualities cost approximately $1,500,000. To produce the same tonnage of high-grade sheets there would be an increase in plant cost from 25 to 35 per cent.

About eight years ago when the automotive sheet business had reached considerable proportions and had the earmarks of further rapid increase, great impetus was given to the manufacture of sheets by the first installation of 4-high continuous hot mills to convert a slab approximately 3 inches thick into a strip from 1/16-inch minimum thickness by 30 inches wide, to ⅛-inch thick by 48 inches wide. One instal-

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Users of products and processes developed by Units of Union Carbide and Carbon Corporation benefit from a most unique coordination of scientific research with manufacturing, sales, and service facilities. You are cordially invited to visit this summer the numerous exhibits sponsored by the Corporation in both the Basic and Applied Science sections in the Hall of Science at Chicago's 1934 A Century of Progress Exposition.

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lation led to others until today there are several such mills, in some of which it is possible to roll perhaps 60 inches wide to as thin as 1/16-inch from 2½ or 3-inch slabs.

The striking feature in connection with the conversion of a slab into hot rolled strip on this particular type of mill was the extremely low labor cost per ton. In other words, the operation was done with practically no labor. The cost of such plants is high and if an average were taken of the plants now in existence in the United States, it would probably be found that none cost less than $6,000,000, and some have cost between $8,000,000 and $10,000,000.

If these various 4-high continuous hot strip mills were equipped with the necessary capacity of furnaces for reheating slabs before rolling and be given the necessary equipment to take away the material at the maximum rate of rolling, any and all of them could be pushed to a production of 500,000 to 750,000 tons of strip per annum.

Allowing 15 per cent interest and depreciation on a plant costing $8,000,000, with 600,000 tons production per annum the fixed charges per ton would be $2.00; with 400,000 tons, the charges become $3.00; but if the tonnage dwindled down to 200,000 the amount would become $6.00 per ton.

This question of fixed charges per ton of production has been a great hardship during the recent depression in connection with all 4-high mill installations, since many of them were installed toward the decline of the previous high production period and there had been no time to write off the investment to any extent.

Introduction of the 4-high mills for hot rolling strip brought about other features connected with the further conversion of this hot rolled strip into sheets. This operation has been done by different methods.

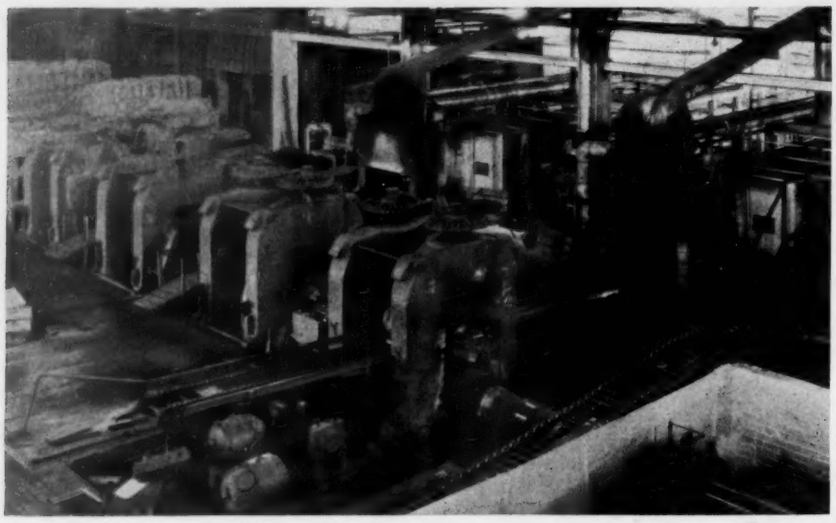
Originally the idea was to take hot rolled strip of the width required for the final sheet plus side scrap, cut the strip into breakdowns, and then hot roll these to the final gages in the same manner as would have been done had the rolling started with bars. During the time the 4-high mill was being perfected as a hot rolling unit, consideration was being given to its use as a cold rolling unit. Many producers formerly considered it impossible to punish hot rolled strip by cold rolling to any great extent without annealing to soften it for further cold rolling. However, by increasing the size and strength of the mills to withstand the necessary working pressures and providing sufficient power, it has been conclusively proven that a properly designed 4-high cold mill can cold roll the hot rolled coils from 0.109-inch thick or thicker to 0.030-inch and thinner without annealing and give the metal reductions of 30 to 50 per cent per pass.

Coils have been cold rolled from 0.250 to 0.010-inch without annealing. These cold mills require a tremendous amount of power and are expensive but further experience with their use in cold rolling strip to sheet gages and to the thinner gages of tin plate (0.012 to 0.0105-inch) eventually will prove them to be feasible and exceptionally low conversion cost units provided, of course, that sufficient tonnage is available to justify the expenditure for hot and cold strip mills, or can buy hot rolled strip at a reasonable price per ton to roll on the cold mills.

While the development of the 4-high mill as hot and cold rolling units was taking place, the large number of companies manufacturing sheets by the old type methods, that is, hot rolling in packs, found themselves being left in the lurch on costs, particularly in 1930 and 1931 when the demand for sheets was at the peak. They had certain investments in their existing plants and began to cast about for ways to increase their production per unit of equipment and per man, and thereby be able to reduce their costs to a point which would permit their product to become competitive with sheets produced by hot strip mill rolling and the finishing methods then practiced.

This led to the development and use of several kinds of equipment applicable to existing sheet mills, including:

1. Continuous pair and continuous pack furnaces for heating bars for roughing and heating breakdowns and packs for finishing.
2. Equipping the ordinary 2-high hot mill with automatic feeder and catcher tables.
3. Improvement in mechanical doublers.
4. The installation of conveyors and various mechanical means of handling material between the different points of operation.



Mechanized sheet mill showing continuous pair and sheet furnace and automatic feeder and catcher tables

Bars Delivered Automatically

In the present type of continuous pair furnaces the bars are charged either singly or two-high, in one row or in two rows, and delivered automatically to the roughing mill by pushing a button on the roll housing. The temperature is controlled to the degree required for proper heating. High-grade bars are heated to a lower and more uniform temperature than bars for ordinary sheets. In the pair furnace the same process applies, namely, packs charged into the rear of the furnace and properly spaced by hand are delivered to the mill by pushing a button.

Automatic tables, front and back of the finishing rolls, have done many things to decrease costs and increase production. On packs the return is faster than ordinarily can be attained by hand, and the entry of the pack into the mill from the front table can be made quickly and exactly central. With pack furnaces of sufficient heating capacity and with the control for furnace discharge and delivery of packs to the mill, it is possible to operate a 2-high finishing mill equipped with these automatic tables with two men on the front side (one as a spare) and no one on the catchers side. Skill and speed with this equipment have been attained to such a degree that on one mill in India, finishing packs to shear 96 inches long, giving them one pass "run over" and after reheating three passes "finish," four passes total, an average time of 28.173 seconds finished pack to finished pack on the cooling conveyor has been maintained for over six hours as mentioned in the

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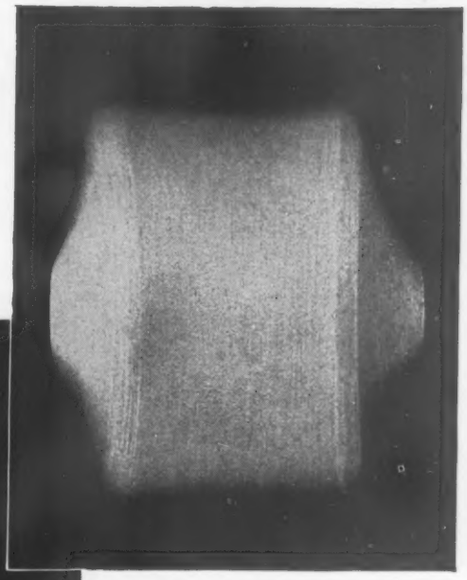

End View of Cold-Bent Plate

Note high ductility with complete freedom from cracking in this as-rolled Cromansil plate.

Cold Bend of Cromansil Plate

This one-inch boiler-plate grade of Cromansil steel in as-rolled condition was cold-bent flat on itself with 80 per cent elongation on the outside of the bend and with no fracture.

■ As-rolled or normalized Cromansil (a chromium-manganese-silicon alloy) can be cold-bent more than 180 deg. around a pin whose diameter is 1-1/4 times plate thickness. These are its physicals:

Carbon	0.20 per cent.
Plate thickness	3/4 in.
Proportional Limit (psi)	47,500 lb. per sq. in.
Yield Point (psi)	61,800 lb. per sq. in.
Ultimate Strength (psi)	95,000 lb. per sq. in.
Elongation in 8 in.	22 per cent.

In its as-rolled condition, Cromansil can be welded without difficulty; and tests at Lehigh University have proved its excellence for riveting. ■ Any open-hearth operator can produce Cromansil steel without departing from usual metallurgical procedure. Its higher cost is justified by its higher physical properties which make it suitable for saving weight in seamless tubing, ship plate, castings, structural shapes, tanks, cars, pen-stocks, staybolts, pressure and process equipment, pipe, and machine parts. Our new booklet, "Cromansil Steels," gives the complete story. Send for it now.

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Oct. 2, 1933, issue of STEEL. This rate of operation shows that 26.6 per cent of the roll surface was actually in contact with metal during the entire 6-hour period.

An extremely high rate of rolling such as the foregoing will raise the temperature of the rolls to a dangerous degree unless the closest attention be paid to this feature. Since the finishing rolls are chilled iron, there is a limit to the temperature at which they will operate successfully and the heat, which is poured into them from contact with the hot packs on the various passes, must be dissipated at a rate sufficient to keep the surface temperature to about 700 degrees Fahr. maximum. Beyond this the rolls are liable to breakage, or low life due to overheating.

The maximum output per 8-hour shift known to the writer as having been rolled on one 2-high mechanically equipped finishing mill is 60 gross tons sheared, opened and weighed material 0.0225-inch thick. This was a recent performance reported from India.

Mill Is Gaining Favor

The 3-high mill which was used for many years as the finishing stand of a jobbing mill, and for that purpose, had large diameter top and bottom rolls and a smaller middle roll, again is coming into favor. The bottom roll only was driven, the unit therefore operating as a "jump" mill. This type mill now is being used for different operations in the manufacture of sheets such as:

(a) Roughing universal mill hot rolled strip.
(b) Roughing continuous mill hot rolled strip.
(c) Roughing bars.
(d) Running over and finishing high-grade sheets.

The latest development for roughing bars on this type mill is to have the top roll positively driven through pinions, the top and middle rolls counterbalanced, and the middle roll actuated by the tilting of the back table. It is customary practice when roughing a pair of sheet bars to give them each one pass through the bottom and after returning through the top on pass No. 2, match them automatically and then give them three additional passes, or five in all. Claim is made that bars to shear approximately 60 net tons of sheets can be roughed in 8 hours. This may be increased by a close study of table and mill operations and slight changes in the tables and controls to save every fraction of a second possible on the operating cycle. A time, pair to pair, of 20 seconds has been reached over short periods, but it is possible to reduce this to an average of probably 16 seconds over an 8-hour shift.

The 3-high mill needs a crew of only a few men. As usually operated it is run as a "wet mill", that is, the mill is kept cold with water on the top and bottom rolls which is wiped off after it has come in contact with the rolls so that it can not get on the sheets. The rolls must be ground differently than hot mill rolls.

This type of mill presents another advantage in that packs of two's roughed from pairs can be kept continually to practically the same length and thickness in a definite number of passes throughout the different shifts, and at the same time keep all packs to practically the same shape on their tail ends. This is an indication of the shape or contour of the roughing mill which must be definitely related to the shape or contour of the hot mill on which the packs are to be finished.

Rolls Polished Mechanically

The question of automatic polishing of top and bottom rolls on a 2-high hot mill has been solved to such an extent that the lost time previously necessary for hand polishing has been eliminated to a great extent. Also by proper control of the rate of travel of the polishing blocks across the face of the roll, it is possible not only to keep the surface in fair shape and free from specks of scale, but also keep down the "bearings" of the rolls, that is, the points near the ends of the rolls just outside of the line of contact with the edges of the packs.

Use of automatic polishers on the top and bottom rolls of a 3-high mill, so far as we know, has not yet been tried but undoubtedly will be attempted in the near future. The probability is that when a 3-high roughing mill is so equipped, the steel rolls can be kept in a sufficiently good condition to eliminate much of the changing of top and bottom rolls which is necessary today, particularly when roughing autobody sheet bars. The middle roll must be changed frequently, these changes being necessary every 6 to 8 hours minimum to possibly 32 to 48 hours maximum, dependent upon the grade of bars being roughed. Steps are being taken in design of the 3-high mills to permit changing the middle rolls with the mill running and thus avoid the shut down otherwise necessary for this operation.

Generally speaking, the present practice of rolling sheets in the United States, as has been previously described, may be divided into four different methods.

1. Roughing of 8 to 14-inch bars by hand, and after reheating, the finishing of these bars in packs to final gage and length by hand, all rolling being done on 2-high mills. In some cases the mills are equipped with modern furnaces.

2. Roughing by hand of bars heated in continuous furnaces and the finishing of the packs on any one of a number of finishing mills, each fed by a continuous pack furnace and equipped with automatic mechanical tables. All rolls are 2-high.

As has been pointed out, a modification of this is taking place because of the introduction of the 3-high roughing mill to eliminate hand roughing.

3. The hot rolling to finish gage in packs, on 2-high or 3-high finishing mills equipped with automatic tables, of "breakdowns" from a 4-high continuous hot strip mill, after heating in continuous pack furnaces.

4. The cold rolling of hot rolled strip in long coils (weight ranging from probably 2000 pounds to 6000 pounds maximum), from hot rolled thickness to final gage without annealing, either in single stands of 4-high cold mills, or in stands of 4-high mills placed in tandem.

As has been mentioned the labor cost per ton of finished product is undoubtedly the lowest by the last named process. As indicated, the cost of this type of plant is high and unless enough tonnage is available as a divisor, the fixed charges per ton of product may be high and prohibitive.

Cites Future Development

Looking forward to the future development in the next few years, assuming of course that the steel industry comes back into its own and that there is again sheet tonnage enough to justify the necessary expenditure, it is entirely within the realm of reason, based upon past performances, to look forward to something like the following:

1. Hot rolling of heavy slabs into coils, to widths slightly over that required for the final sheet, and to a thinness that will be most economical for the combination conversion from slab to final sheet gage by hot and cold strip rolling. Due consideration must be given to the evenness of gage from one end of the hot rolled strip to the other.

2. Spot welding of these coils one to the other; passing them through a continuous pickling, scrubbing and drying machine; and the cutting out of these welds and recoiling into coils after pickling.

It may be possible to further perfect the process of end-butt welding to such an extent that cutting out the welds will not be necessary. In other words, perhaps the welds can be made strong enough to stand the punishment of cold rolling.

3. Cold rolling of these coils in 4-high tandem mills with sufficient stands to reduce the metal to the final gage, and coil it after the last pass.

Again, as mentioned under 2, if end-butt welding can be perfected it may be possible to roll welded coils of exceedingly long lengths to final gage. This would eliminate to the greatest possible extent the time which is necessarily lost when removing a finished coil and starting a new one.

4. Annealing or normalizing of

(*Please turn to Page* 42)

The Plastic Forming Of Metals

By PROFESSOR DR.-ING ERICH SIEBEL
Translated by JOHN H. HITCHCOCK

Part III—Investigations of Distribution of Deformation and Stress in Technical Forming Processes

4. Stress Relations in the Skew Rolling Process*

SKEW-ROLLING embodies two phases. In the first part of the pass, the round billets to be pierced are acted upon only by the rolls, which rotate in the same direction; whereas in the later part, a transverse rolling of the tube occurs between the two rolls and the intermediate plug. From the rolls and from the mandrel, normal forces are exerted upon the rolled material which accordingly act normally to the working surfaces. Frictional forces are transmitted, the highest values being determined by the momentary effective normal forces and the coefficient of friction between rolls and billet. The frictional forces always are directed to oppose the displacement of the material relative to the surface of the roll. The magnitude of the forces exerted by the rolled material depends upon the reacting pressure of the material, which in turn corresponds to the deformation strength of the deformed material and to the prevailing stress relations at this point.

Moves in Axial Direction

In addition to the movement of rotation, the rolled material because of the oblique position of the rolls, still is subjected to a movement in the axial direction which is accordingly a movement of feed; the rolled material to some extent is twisted through between the rolls. Although the relations of movement of the roll surfaces are stipulated geometrically by the angular velocity of the rolls, the shape of the pass, and the angle of oblique adjustment*, this is not the case for the tube blank. Because the feed forces, which are required to overcome the deformation resistance, can be transmitted from the rolls to the tube blank only by friction, and since the frictional forces are directed to oppose the relative displacement between rolls and blank; a relative displacement of the tube blank with respect to the surface of the roll must occur in the direction opposite to the direction of feed, or in other words, a backward slip of the material must take place.

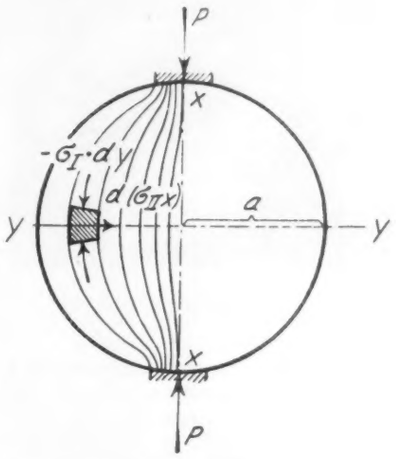


Fig. 159—*Stress distribution in a transversely-stressed cylinder*

In the first section of the pass, the rotating bar is subjected by the rolls to transverse compression in each direction twice in each revolution. In contrast to ordinary compression, the distribution of stress in such a transverse compression is not uniform. Qualitatively, a picture can be formed of the condition of stress existing at the center of a round bar which is stressed transversely to its axis, if the probable course of the stress trajectories is drawn; under consideration of the conditions that in the vicinity of the outer surface the trajectories must be parallel or perpendicular to that surface, and at the plane of symmetry they likewise must be parallel or perpendicular to the latter. If a probable distribution is assumed, such as that of Fig. 159, it is observed that equilibrium can exist on each element of area in the transverse plane only when, in addition to the compressive stresses ($-\sigma_I$) acting perpendicularly to the transverse plane, tensile stresses (σ_{II}) act in the direction of that plane, which tensile stresses increase from zero at the edges to a maximum value at the center.

For the elastic stress condition, the exact stress distribution in such a transversely-stressed cylinder (roll), of radius (a) and length (l), is known. In the center the compressive stress acting in the direction of the external forces (P) is calculated according to Foppl[102] as:

$$\sigma_I = -\frac{3 \times P}{a \times l \times \pi},$$

and the transverse tensile stress is computed as:

$$\sigma_{II} = \frac{P}{a \times l \times \pi}.$$

If the load is increased, flow occurs first in the vicinity of the surface where the load is applied, and is extended with increased loading up to the center of the cross section (Fig. 160), during which process the cylinder assumes an approximately el-

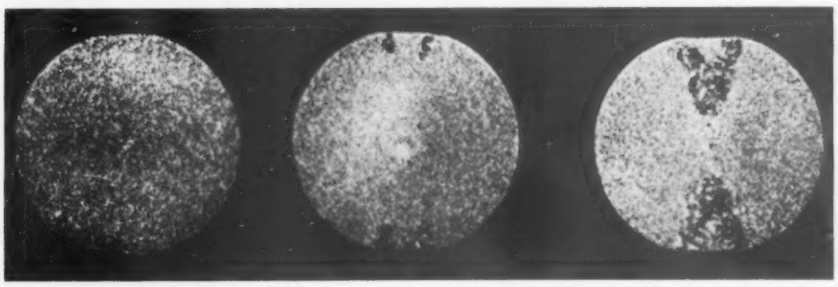


Fig. 160—*Formation of zones of flow in a transversely-compressed cylinder of mild steel (recrystallization test)*

*Developed according to E. Siebel[112].

*F. Kochs[101] gives a detailed description of the relations of movement in the various skew-rolling processes. See also K. Gruber[103].

[101] References pertaining to the skew-rolling process: F. Kochs: Ber. Walz.-Aussch. V. d. Eisens. No. 47 (1926); St. u. E. 47(1927)p.433/46. —J. Gassen: Arch. Eisenhuttenwes. 1(1927)p.127/36 (Gr. C. Walzw.-Aussch. 50); St. u. E. 47(1927)p.1661/63. —G. Lobkowitz: Rohrenind. 19 (1926)p.49/51, 97/99, 113/15, 129/31, 145/48; 20(1927)p.103/04, 199/201. —K. Gruber: St. u. E. 39(1919)p. 1029/36, 1067/75, 1096/1100, 1174/77, 1204/08, 1239/44. —J. Gassen: St. u. E. 41(1921)p.1958/61.

[102] A. and L. Foppl: Drang und Zwang; First edition, vol. 1; R. Oldenbourg, Munchen and Berlin 1920.

Fig. 161—Formation of flow lines in a transversely-compressed cylinder of mild steel (etching according to Fry)

liptical cross section. The plastic deformation thereby remains restricted to the central part of the body lying between the two loaded surfaces, whereas the laterally located sections primarily are deformed only elastically. Because the compressive forces are distributed over a large area in the central transverse plane, the compressive stresses have a minimum value here. On the other hand, additional transverse tensile stresses occur in the center of the body, the formation of which probably is favored only by the inception of plastic deformation. These normal stresses must correspond to a severe shear stress at the center, along the planes inclined at 45 degrees to the line joining the points at which the load is applied. This shear stress leads to the phenomena of flow which are reproduced in Fig. 161 for a transversely compressed mild steel cylinder.

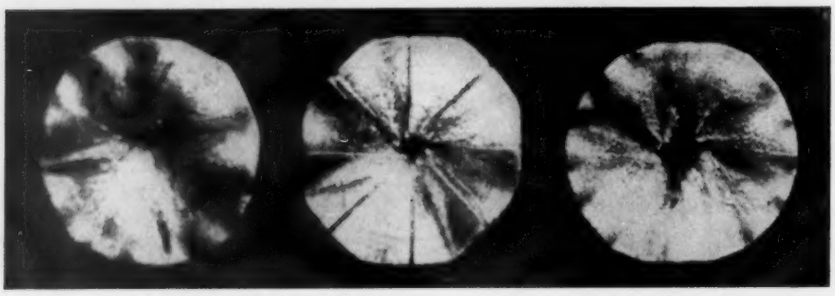


Fig. 162—Formation of holes in transversely-forged aluminum cylinders

Surfaces Become Distorted

If the transversely stressed cylinder rotates between two cylindrical rolls which rotate in the same direction with respect to each other, and which at first are not set obliquely, the surfaces of load application, continued along the circumference of the cylinder, become distorted, and the principal direction of deformation correspondingly is altered permanently, so that the cross-sectional ellipse retains its position with respect to the rolls in spite of the rotation of the bar. Although the parts lying in the vicinity of the outer surface are deformed severely and plastically only when they pass under the compressing surfaces, the central zone undergoes a severe and uninterrupted deformation by shear in which the direction of displacement changes continuously, corresponding to the rotation of the bar. The deformed material usually appears to withstand this severe stress only a short time, particularly because tensile stresses act in the transverse direction, and a hole thus is formed in the center. In the work of Wolff and Kochs[101], the process of formation of the hole is verified, polished and etched specimens taken from billets in which the piercing process was interrupted.

Relations Are Similar

Similar stress relations are formed also in the transverse forging of round bodies if these bodies are rotated by a small amount after each compression. Fig. 162 shows hollow bodies produced in this way. In this forging test, it was found that for the production of a transverse compression of 5 per cent, the average pressure referred to the central plane amounted to about 50 per cent of the deformation strength of the material; whereas for the production of a transverse compression of 10 per cent, a pressure amounting to about 60 to 70 per cent of the deformation strength was required.

The pressure of deformation (P) can be calculated, as a first approximation, under the assumption that the initially circular-shaped cross section of radius (r) and diameter (d) becomes transformed by deformation into an elliptical cross section with uniform plastic deformation in all parts of the cross section. For the work of deformation required in the calculation of an infinitely small deformation, the relations then are obtained:

$$dA = 2 \times P \times dr = V \times \frac{dr}{r} k_f =$$

$$\pi \times r^2 \times l \times \frac{dr}{r} \times k_f;$$

from which the force of deformation, P, is found to be:

$$P = \frac{\pi}{2} \times r \times l \times k_f =$$

$$\frac{\pi}{4} \times d \times l \times k_f = 0.8 F \times k_f.$$

The force of deformation, by this approximate calculation, amounts to about 0.8 times the product of the deformation strength (k_f) and the cross-sectional area (F) of the bar in the central plane. The deviation of this value from the results provided by tests is explained by the fact that the assumption of a uniform deformation really does not agree with practice (see Figs. 160 and 161).

In addition to the displacement of material in the transverse direction, which leads to the described distortion and kneading of the rolled material and finally to the formation of a hole, a displacement of material also occurs in the longitudinal direction. This is greatest in the parts of the cross section in the vicinity of the compressed surfaces, which are subjected to high compressive stresses. The displaced material flows out here partly in the longitudinal direction, whereby a condition of equilibrium can be established for the resistance to flow which acts in the transverse and longitudinal directions. The central zone thus is drawn along by the outer zone, because the deformations are influenced by the cohesion of the material. The drawing-in of the material at the center and the concave formation at the ends of skew-rolled billets take place in this manner.

Produces Concave Form

These relations can best be indicated experimentally by cross-rolling or cross-forging narrow disks. Even a small amount of cross-rolling suffices to give such disks a concave form. If a longer cylinder, which can be considered as being composed of many individual parts, is hindered from the designated sort of deformation by the cohesion of the material, axial tensile forces at the center and axial compressive forces in the outer zones of the rolled material must be produced, so that a distribution of stress arises which is similar to that shown in Fig. 163. The following test indicates the extent to which radial and axial tensile forces are produced in the center of a cross-rolled round body. An aluminum disk 1.57 inches diameter and 0.590-inch thick was forged transversely under the press, with a reduction of 0.059-inch each half-revolution, into a 16-sided block with an outer diameter of 1.28 inches. A section situated in the direction of the axis of

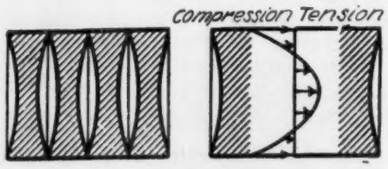
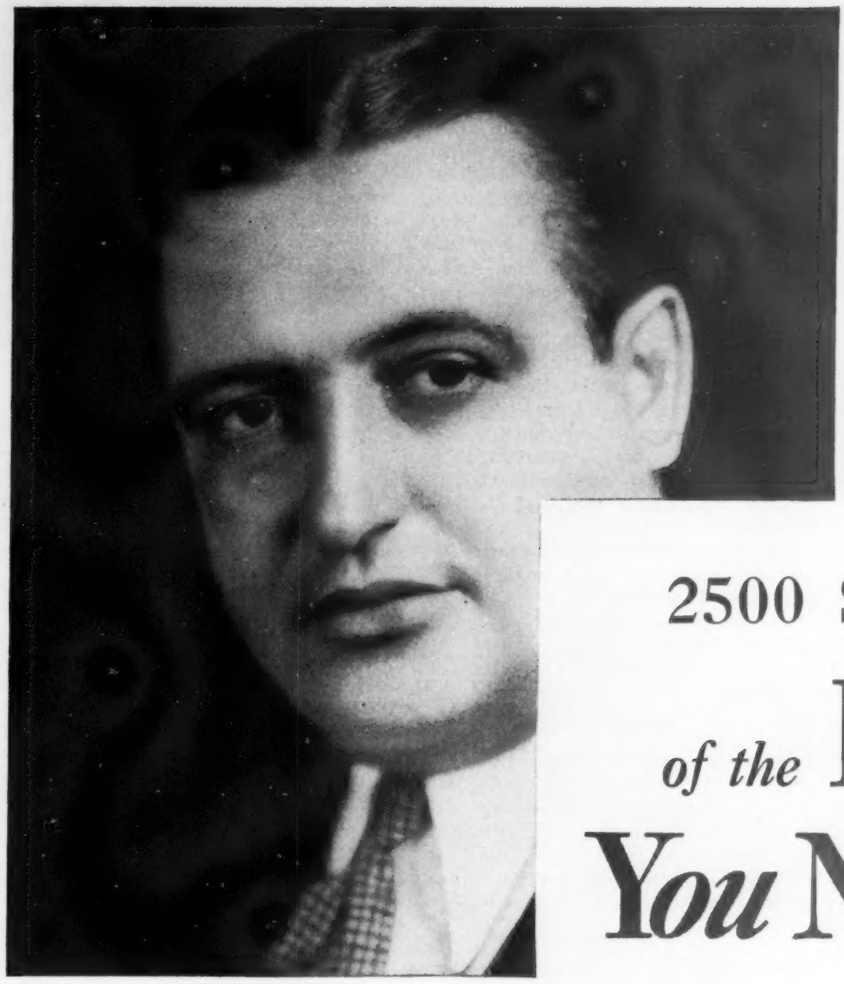


Fig. 163—Formation of concave shape and of axial stresses during transverse forging



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the block then reveals the shape reproduced in Fig. 164. At the outside, the thickness of the disk has increased from 0.59-inch to 1.14 inches. At the center, however, it has decreased from 0.59 to 0.43-inch. A considerable portion of the material therefore has been drawn from the center toward the outside.

The tensile stress produced in the center during cross-rolling makes it possible for the cavity to attain a considerable inside diameter even without the effect of the mandrel. The experimental proof of this fact was brought out by A. Noll[100]. After the first formation of the hole takes place, the radial stresses along the wall of the hole immediately vanish.

Diameter May Increase

A further increase of the diameter of the hole, then, is still possible only if the longitudinal tensile stresses at this point become so great that material flows out in the longitudinal direction, with corresponding reduction of the wall thickness of the hollow body. This process is limited by the fact that the wall always must retain sufficient thickness so that a plastically-stressed region can be formed at the compressed surfaces. If the hollow body is too thin-walled to satisfy this condition, it only becomes pressed together as a result of rolling, without the occurrence of further flow of material. J. Gassen[101] has investigated these relations experimentally on round bodies provided with holes of various sizes.

The described phenomena are not altered fundamentally when the rolls are set obliquely, and when the rolled material, in addition to the rotational movement, thus becomes subjected to a feeding movement. Whereas the introduction of the cross-rolling process between parallel cylindrical rolls requires an adjustment of the rolls toward each other, a slightly conical form of the roll opening in the axial direction now suffices to give the billet the required transverse pressure in its forward movement. Gripping, cross-rolling, the forming and expanding of the cavity now follow one another in each cross section of the billet, because each cross section as it advances passes through the successive zones of the pass.

As already mentioned, the formation of a cavity by means of simple cross-rolling is subjected to certain limitations, because the wall thickness of the hollow body cannot be less than an amount necessary for the formation of a plastically-stressed zone at the compressed surfaces. A further reduction of wall thickness now can be achieved, if the hollow body formed by cross rolling is rolled transversely over a plug held on the end of a mandrel bar. In the second section, the two skew-rolls form with the rotating plug a sort of 3-high rolling mill, in which the rolled material is carried around the middle roll and becomes compressed forthwith, while it travels from one pass to the next as a result of the helical forward movement. Ahead of the highest point of the rolls, the displaced material thus flows out toward the rear. Beyond the highest point, the rolled material essentially becomes compressed; that is, the circumference of the tube increases. A part of the displaced material even here, however, usually flows out in the axial direction opposite to the direction of feed, because the pass formed by the rolls and the mandrel becomes wider toward the entering side, and for this reason a relatively smaller resistance opposes the flow of material in this direction.

The two roll sections practically need not undergo sharp separation,

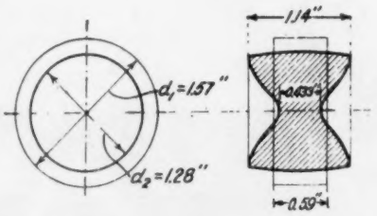


Fig. 164—Deformations during transverse forging of an aluminum disk

which was assumed earlier in order to facilitate comprehension of the fundamental processes. If the mandrel is slender, and if the entering cone has only a slight inclination, the mandrel can be placed so far forward that its point stands in the zone at which the formation of the hole otherwise occurs. Then the formation of a hole no longer can take place. Instead, the piercing process is the consequence of the combined influences of the cross-rolling and the pressure on the point of the mandrel. The axial force thus exerted on the mandrel point remains comparatively small; for the reason that, in plastic deformation, the difference between the effective principal stresses is equal to the deformation strength. The point of the mandrel accordingly is relieved the more effectively, the more the transverse tensile stresses produced by the cross-rolling process can come into action. This statement can be confirmed in practice by measurements of the force on the mandrel.

Investigation Is Limited

If an exact conception of skew-rolling is desired, an opinion must be formed regarding the force relations in the region of contact, so far as this is possible in such a complicated forming process. More than qualitative conclusions concerning the method of operation of the skew-rolling process probably should not be expected, because the exact stress distribution in a cylinder which is stressed plastically by transverse forces is not known, and because the frictional relations are extraordinarily difficult to evaluate. The investigation first must be limited to the conditions of external equilibrium in the region of contact. For this purpose, the bar is considered as being divided into narrow disks, and the forces applied to such a disk in the individual zones of the pass now will be determined.

(To be continued)

[100] A. Noll: St. u. E. 47(1927)p.1692.

Low-Carbon Ferrotitanium Offered to Steelmakers

For use in deoxidizing heats of steel which must finish about 0.02 per cent carbon, such as deep drawing and high finish automobile stock, ingot iron and similar soft steels, a new low-carbon ferrotitanium deoxidizer has been developed by the Titanium Alloy Mfg. Co., Niagara Falls, N. Y. The new product is to be known as TAM *low-carbon* FCT, in contrast with TAM *original* FCT, a deoxidizer developed in 1906, containing about 7.5 per cent carbon, and used widely in steelmaking operations.

The company will continue to offer both grades which, it is claimed, facilitate the production of stronger, cleaner and more homogeneous metal. Used in cast iron, standard low-carbon ferrotitanium is said to insure greater strength and increased machinability, as a result of fineness of graphite flakes.

Sheet Mill Increases Output

(Concluded from Page 38)

these long finished coils in a continuous type of furnace, which will be combined with a continuous pickling, scrubbing and drying machine and following by a tandem stand of flattening cold rolls. It also may be possible to cut the metal coming out of the flattening cold rolls to the exact final or near final length on a flying shear. The sheets then will be ready for inspection, resquaring, roller or stretcher leveling, oiling and shipping.

If and when this be an actuality, then so far as labor is concerned, it would seem that the cost of conversion from an ingot to a final sheet will have reached the absolute minimum. The fixed charges will vary with the tonnage. In face of the present existing conditions in the steel and sheet industry in this country, it will probably be some years before the foregoing complete set-up will be justified.

PROGRESS IN STEELMAKING

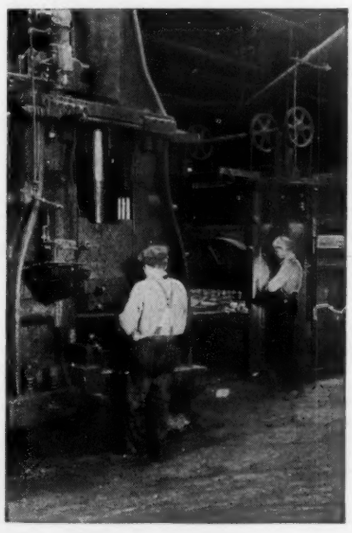
SURFACE temperature of rolls now can be determined by a newly devised pyrometer which indicates temperatures from 0 to 1000 degrees Fahr. through a ribbon-type thermocouple.

♦ ♦ ♦

Inaccurate weights of tin plate have been eliminated at a plant in England by the installation of a recently developed machine which automatically sorts and weighs the coated stock. Sheets delivered to the tin house are fed into the machine and are separated into three piles—one of specific weight, another of underweight and the third of overweight stock. A tray to hold the sheets, a guide to direct them to their respective sorting trays, a counterpoise weight which can be moved to any weight of sheets on the graduated beam, and a percentage indicator also are incorporated. The machine, which can be carried by two persons, can be connected with the cleaning machine drive or driven by a 1/6-horsepower motor.

♦ ♦ ♦

One of the latest types of primary washers for cleaning blast furnace gas incorporates a redesign of a cleaner long used in European plants for eliminating fly-ash. A high state of cleanliness is claimed for gas subjected to this new unit.

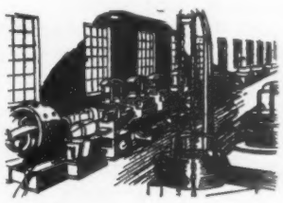


♦ ♦ ♦

Plating the impressions with chromium has been found in a majority of cases to increase the life of the die from 20 to 50 per cent.

♦ ♦ ♦

Installation of a hearth 61 x 3¼ feet in an angle-heating furnace was effected recently in 2 hours, and at a labor cost of $9.92 by the use of a chrome-base castable refractory.



APPLICATION of water-cooled holders to all tungsten carbide dies in the wire drawing department of an eastern mill has reduced the amount of cleaning appreciably. Since resorting to water cooling the dies remain in service five times longer without the necessity of returning them to the die room for cleaning, thus affording an increase in production.

♦ ♦ ♦

Chutes and liners, bin gates and grizzly bars for handling coke, limestone, ore and other abrasive materials around coke ovens, blast furnaces and steelworks, are claimed to give from two to 12 times longer life when fabricated from a new alloy cast iron.

♦ ♦ ♦

Results of a study of the behavior of materials other than plain carbon steels for such use as coal and coke chutes at by-products coke plants leads to the general conclusion that chrome and chrome-nickel alloys withstand the combined action of water and sliding coal or coke abrasion much better than does plain carbon steel. Study of the data indicates that an alloy of 20 per cent chromium and 1 per cent copper is superior to chrome-nickel steels. Two 18-8 steels and a 27 per cent chromium steel are next; followed by a steel containing 12 to 14 chromium and 0.12 carbon; one containing 16 to 18 chromium and 0.10 carbon; and, one containing 12 to 14 chromium and 0.30 carbon.

♦ ♦ ♦

Consistent results and low maintenance cost are claimed for a newly devised electric furnace adapted to all types of annealing, normalizing, nitriding, carburizing, drawing and tempering, and particularly to the heat treatment of steel sheets. Heating elements are incorporated in the hood. The latter is removable, as are the bases upon which the charge is piled, several of which can be used in connection with an individual hood. Bases can be located centrally or at convenient stations in the plant, and the hood transferred from one location to another. During a cycle of operation one base is loaded with sheets to be annealed, the hood placed over the charge, the desired temperature applied under uniform control and the hood then removed to another loaded base for heating while the previous batch is cooling. The cooling base may be covered either before or after the heating. The egress of furnace atmosphere and the ingress of air are prevented by a dual seal arrangement. One of the most important features is the diffusing device for controlling the furnace atmosphere, which insures a complete and uniform distribution of the atmosphere throughout the furnace.

A.S.M. Meeting on Grain Size Attracts Wide Attention

GRAIN size in steel proved to be a subject of sufficient interest to attract more than 200 members of the American Society for Metals to the annual tri-chapter meeting of the Cincinnati, Dayton and Columbus chapters in Columbus, O., April 24. The program consisted of a technical session at Battelle Memorial institute in the afternoon and a dinner and technical session at the Columbus Athletic club in the evening.

Reflecting the intense interest in grain size and an improved industrial situation, as compared with one year ago when the annual tri-chapter meeting was held in Cincinnati, the Columbus meeting was widely attended by representatives from 15 chapters of the society, including New York, Lehigh Valley, York, Syracuse, Buffalo, Pittsburgh, Cleveland, Canton-Massillon, Columbus, Dayton, Cincinnati, Detroit, Indianapolis, Chicago and Milwaukee.

National officers of the American Society for Metals who attended the meeting were: President W. H. Phillips, vice president, Molybdenum Corp. of America, Pittsburgh; Vice President B. F. Shepherd, manager, rock drill division, Ingersoll-Rand Co., Phillipsburg, N. J.; Secretary W. H. Eisenman, Cleveland; Director and Founder Member W. P. Woodside, Climax Molybdenum Co., Detroit; and Director E. C. Bain, research metallurgist, United States Steel Corp. Research Laboratories, Kearny, N. J.

Steel Experts Heard

Papers presented at the afternoon session were "Grain Size in Steel Castings," by C. E. Sims, assistant research director, American Steel Foundries, Chicago; and "Importance of Grain Size of Sheet Steel for Deep Drawing," by R. L. Kenyon, supervising research engineer, American Rolling Mill Co., Middletown, O. A third paper, "Steelmaking and Grain Size Control," by Dr. C. H. Herty Jr., director of research, mining and metallurgical advisory board, Carnegie Institute of Technology, Pittsburgh, had been scheduled, but Dr. Herty was unable to attend the meeting on account of illness. Dr. O. E. Harder, assistant director, Battelle Memorial institute, officiated as chairman of this session.

H. W. McQuaid, metallurgical division, Republic Steel Corp., Youngstown, O., was the principal speaker at the dinner meeting. His subject was "Grain Size in Carburizing and Forging Steels." G. N. Moffat, instructor of mechanical engineering, Ohio State university, and chairman of the Columbus chapter, presided.

The afternoon session was opened with Mr. Sims' paper on grain size in steel castings, a paper which in considerable detail reported work which had been done in studying the effect of grain size on physical properties of various types of castings. Attention also was paid to the effects of various alloying elements and heat treatments on grain size. Considerable discussion was provoked by this paper but it was largely of a specific and question-and-answer nature and pertained to alloying elements, physical properties, and the like.

Practical Opinions Given

Because the subject which Dr. Herty was to have discussed was of wide interest, Dr. Harder organized a brief symposium and drafted several speakers to comment upon the relation of steelmaking and grain size control. Once under way, the discussion developed much of interest to both steelmakers and users.

H. W. Graham, general metallurgist, Jones & Laughlin Steel Corp., Pittsburgh, pointed out the lack of definite and conclusive information on the causes and control of grain size and the influence of grain size on the finished steel. He raised the question as to whether grain size is fundamental and if so in what sense is it fundamental?

The finishing of a heat of steel is relatively unimportant as compared with the dispersion of some of the products of the alloying element added, in the opinion of W. R. Fleming, metallurgist, Andrews Steel Co., Newport, Ky. In large quantities of steel, he believed that the addition of aluminum has more effect upon the control of grain size than vanadium, considering the amount of the element added. Mr. Sims, who presented the paper on steel castings, had taken a rather opposite point of view. Mr. Fleming, of course, based his conclusions on the finishing of the steel in the furnace rather than the ladle.

The McQuaid-Ehn test for designating and specifying the grain size of steel has become more or less standard practice, but Mr. Shepherd stated his company has developed a new test which is being used in its stead. Known as the P-F test, the new procedure measures hardness penetration (P) and fracture (F).

According to Mr. Shepherd, ¾-inch specimens are heated to four temperatures, namely, 1450, 1500, 1550 and 1600 degrees Fahr., are quenched and then broken by impact. One piece is examined as to its fracture and compared with a set of fracture standards for grain size. Considerable skill is required to make this comparison, but with experience, the test becomes practical and reliable. The other piece of the specimen has the fracture ground and etched and the hardness penetration is measured.

Mr. Shepherd stated that on the basis of this test it becomes possible to catalog the various test specimens by a series of numbers and from these to rate the steels as No. 1, No. 2 and No. 3 and to specify them to the mills by correspondence. This test will be described in considerable detail in a paper, "The P-F Characteristics of Steel" which Mr. Shepherd will present at a Pennsylvania interchapter meeting to be held at Pennsylvania State college, State College, Pa., May 4-5.

The problem of grain size in steel is becoming increasingly important, commented E. R. Johnson, assistant chief metallurgist, Republic Steel Corp., Massillon, O., because the automotive industry is specifying smaller grain size to an increasing degree. It is becoming more and more difficult to control grain size in low-carbon steels, particularly under 0.10 per cent. Likewise, it is becoming more difficult to obtain uniform grain size with alloying elements.

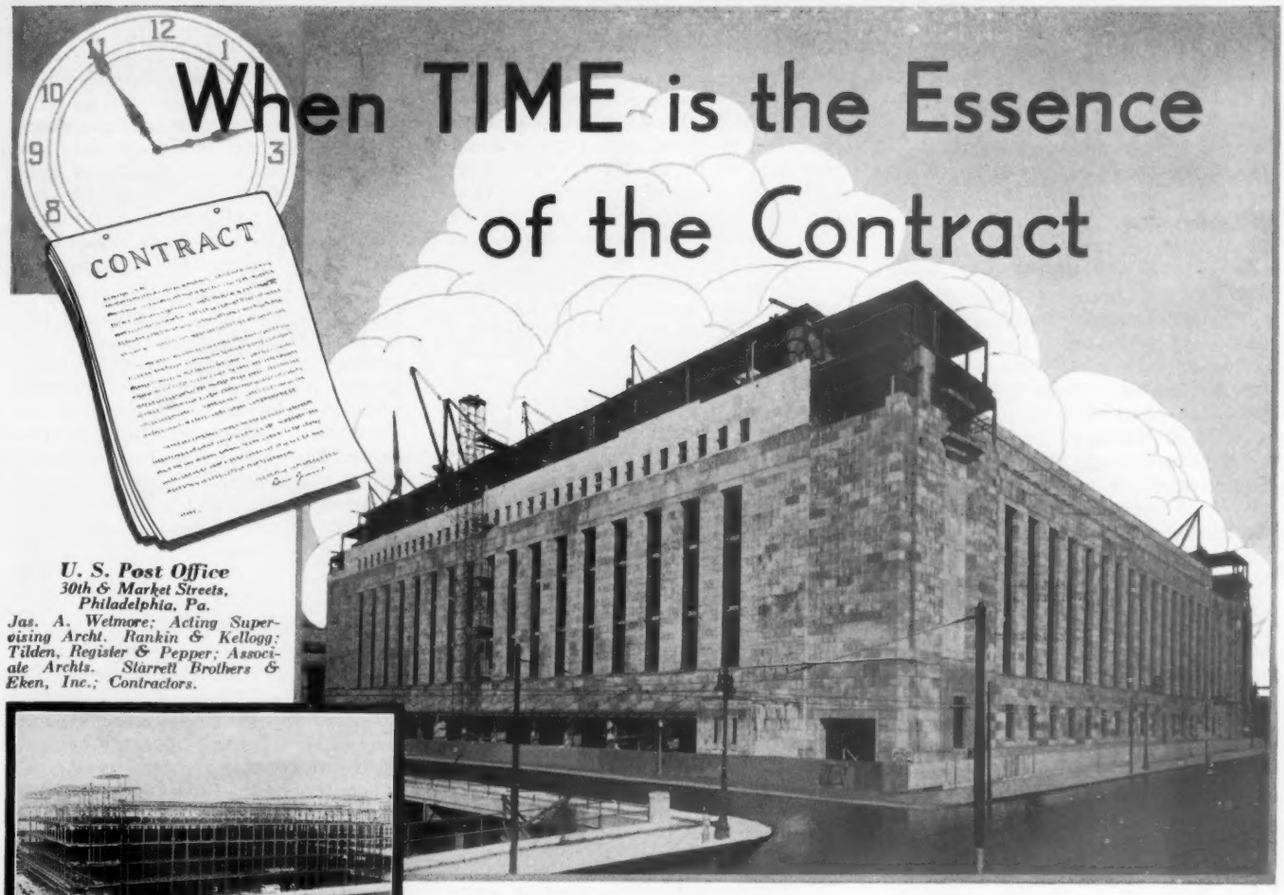
Recalls History of Test

The McQuaid-Ehn test, it appears, is being regarded in many quarters as a grain size test. In this connection, E. E. Thum, editor, *Metal Progress*, Cleveand, pointed out that the original McQuaid-Ehn paper published in 1922 said little about grain size. The research reported referred to the suitability of low-carbon steels for carburizing purposes and had to do largely with normal and abnormal steels. Later developments, however, have indicated a close relationship between grain size and normality or abnormality.

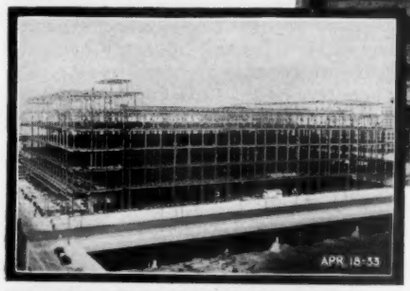
Requirements for deep drawing sheets are constantly becoming more exacting, said Mr. Kenyon, for in addition to larger sizes and lighter gages, users are demanding better surface and improved physical properties. Composition, structure, and thermal and mechanical treatment are several variables which have an influence on physical properties, and although all are more or less interrelated, Mr. Kenyon confined his attention to structure as influenced by grain size. The latter has an important role in the development of superior deep drawing sheets because it affects both physical properties and surface of finished products.

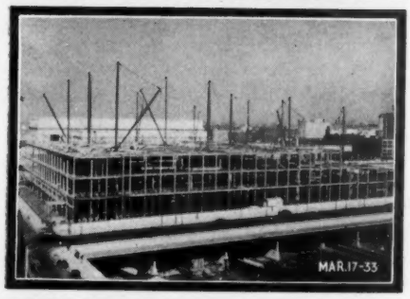
When a metal is deformed beyond

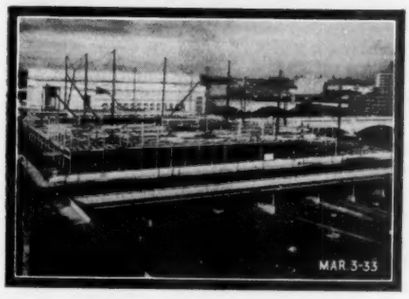
When TIME is the Essence of the Contract



U. S. Post Office
30th & Market Streets,
Philadelphia, Pa.
Jas. A. Wetmore; Acting Supervising Archt. Rankin & Kellogg; Tilden, Register & Pepper; Associate Archts. Starrett Brothers & Eken, Inc.; Contractors.







TIME, whether expressly written into the contract or not, is a ruling factor in large construction projects. Erection of the steel framework, particularly, must be speeded, for on that structural performance the coordination and progress of all other operations depend. The resources of the steel contractor are often measured against demands that tax them to the utmost. Experience, organization, equipment—every facility and capacity must be brought to bear from first to last.

So it was in the case of the great new Philadelphia Post Office. The steel frame for this imposing structure—five full floors, basement and roof, approximately 380 feet by 460 feet in extent and 150 feet high above the track level—was erected by American Bridge Company over the newly electrified main line of the Pennsylvania Railroad at its entrance to the Thirtieth Street Station, without hazard or interference to the regular movement of heavy trains.

The 18,000 tons and more of structural steel were fed continuously to twelve large derricks employed in the work. Expediting this immense tonnage required strict observance of progress schedules; each process, whether shop fabrication, shipment, or field handling, was timed and managed "by the clock."

For bridges, buildings, barges, towers, turntables—on any project in steel, large or small—American Bridge Company fabrication and erection are always at yourservice.

AMERICAN BRIDGE COMPANY

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

General Office: Frick Building, Pittsburgh, Pennsylvania

Contracting Offices: Baltimore, Boston, Chicago, Cincinnati, Cleveland, Denver, Detroit, Duluth, Minneapolis, New York, Philadelphia, Pittsburgh, St. Louis, Salt Lake City.

Pacific Coast Distributors: Columbia Steel Company, Russ Building, San Francisco — *Export Distributors:* United States Steel Products Company, New York

its elastic limit, orderly arrangement of the structure is altered; the two types of internal movement which occur are slip and rotation. If the grains in the steel are sufficiently large, surface upheavals can be seen by the naked eye; however, stated Mr. Kenyon, surfaces found on commercial deep drawing sheets and strip do not show any coarsening that can be detected by the unaided eye if the grains are sufficiently small.

The most useful feature of cupping tests is to show the character of the surface of the sheet after it has received a severe draw. Autobody sheets are lacquered and roughened surfaces would appear rough through the finish; the same would apply to such pieces as hub caps and radiator shells which are electroplated.

Extremely fine grained sheets are found to be somewhat harder than coarse grained ones and it is necessary, said the speaker, to balance requirements of softness and fineness of the grain necessary to obtain the desired degree of smoothness of the surface after drawing. In low-carbon steel, grain size can be varied by cold rolling different amounts and annealing at temperatures in the recrystallizing range and below the A_3 point, or by heating about the A_3 point for various lengths of time and cooling at various rates. Variation of these factors will produce variation in grain size, but there may be a difference in the form of other constituents such as carbides and in the amount of unrelieved strain from rolling.

Fine Grain for Deep Drawing

Deep drawing material is practically all normalized and has a relatively small grain compared with box annealed sheets. Differences in physical properties between large grained box annealed material and fine grained normalized sheets are much greater than the differences occurring between so-called large grained and fine grained normalized material. The range of grain sizes in commercial normalized sheets for deep drawing is from the finest box annealed structure to the finest normalized structure.

Experienced producers, continued Mr. Kenyon, are able to manufacture sheets of proper structure and physical properties for the various types of deep drawing jobs, this depending largely upon design of the part, design of the dies and drawing practice. Some users prefer a finer grained sheet to insure against surface roughening, others prefer a softer sheet with slight risk as to surface; either material would work properly with suitable die practice. Even where die shop practice and press capacities make it advisable to supply a certain grain size material, the sheet maker is able to control this much more closely than can be detected by drawing performance.

To prevent stretcher straining, it is necessary to give sheets a certain amount of final cold rolling, depending upon the particular type of draw they are to be used for. This also affects the physical properties so that the user is unable from any tests he may make to correlate grain size with performance in the die shop.

Principal factors of heat treatment which affect grain size of low carbon steel sheets for deep drawing are time and temperature of annealing and the cooling rate. These, declared Mr. Kenyon, are the variables which the producer can control to obtain the grain size appearing best suited for the particular job.

Anneal To Be Avoided

Sometimes it is necessary to make an intermediate anneal between drawing operations but the temperatures of furnaces available for such annealing often are in the range which may cause critical grain growth. It is almost certain that some drawn shapes have received critical amounts of cold work at some points and these will show abnormal grain growth after a low temperature anneal. The only solution, stated the speaker, is to design the drawing operations so that intermediate anneals are not necessary or else to anneal either below the critical grain growth temperature range or to normalize by heating above the A_3 point and air cooling.

More or less summarizing and setting forth the whole subject of grain size, Mr. McQuaid spoke at considerable length at the dinner meeting. Grain size, he said, is a minimum at the Ac_3 point and a maximum at some higher temperature. The whole problem became a subject for investigation in 1918 when 500 trucks for the government could not be shipped because driveshaft bearings made for them showed soft spots.

This particular problem was solved when the source of the steel was changed, but it did answer the question as to why the soft spot developed in the first steel. According to Mr. McQuaid, the carburizing compound was suspected, but investigation along this line provided no answer. The next step was to follow the steel through from the melt to the finished product and finally after many observations it was concluded that dissolved oxides in the steel were responsible for nonuniform carburizing results.

It is immaterial whether the peculiarity of steel to harden erratically is attributed to timber, body, personality, or some other characteristic, stated the speaker. Regardless of the cause, hardenability of steel is of vital importance and the problem had to be solved. Hardenability has been found to be dependent upon the grain size of the material at the time it is quenched.

Steelmakers today must be able to provide any type of steel which the plant metallurgist wishes to process. Ten to 15 years ago, the steelmaker could do this uniformly for then requirements of steel and heat treatment were comparatively simple. Today, the service of steel is more complex and heat treatments are more extensive and exacting.

Chief interest, said Mr. McQuaid, lies in steels which harden uniformly at heat treating temperatures and normalize uniformly at the proper normalizing temperatures. Despite what may be said, the speaker declared that the characteristics of deep or shallow hardening can be influenced little after the steel is made and poured into the ingot. The problem must be solved by trained physical chemists who direct the practice of melter during the making and pouring of the heats.

Mr. McQuaid cited the experience of one steelmaker producing automobile bumper stock. Some of the material rolled was suitable for bumpers and part of it was not, consequently after considerable investigation it became the practice to use the bottom two-thirds of each ingot for the bumpers and the top third for something else. The problem here, of course, was to find use for the top third.

Grain Size Affects Impact

Impact strength is a very important characteristic in steel. It was pointed out by the speaker that a fine grained structure tends to distribute the stresses through the material and a coarse grained structure tends to localize the stresses and thereby provide poor impact strength. It is highly important that steel have the ability to withstand cold working, to be heated exceedingly rapidly to the critical point and to be quenched without distortion and cracking, for this procedure gives good physical properties. By this treatment, Mr. McQuaid said, it is possible to obtain in straight carbon steel toughness and physical strength equal to some alloy steels.

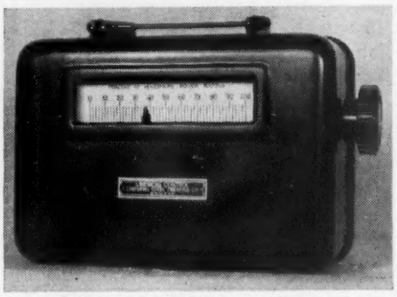
In the opinion of the speaker, open-hearth steels are tougher than electric furnace steels for the same hardness. He expressed the belief that fatigue has no relation to grain size. Coarse grained, deep hardening steel may crack if forged in a few blows; this seldom happens with fine grained, shallow hardening types. For gears, fine grained, shallow hardening steel seldom distorts in hardening.

In concluding, Mr. McQuaid declared that steel frequently is rejected for being 0.02 per cent off on carbon range, although as much as 0.10 per cent could be allowed providing the material has proper grain size.

NEW EQUIPMENT

PRODUCTION FABRICATION
TREATMENT FINISHING

Furnace Control—Lindberg Steel Treating Co., 218-224 Union Park court, Chicago, is offering a new type of electric furnace control, shown herewith, for the close regulation of current input. It is recommended for use in slow heating and cooling, drawing and pot control as well as in zone, hand and maximum demand control. It also is



Electric furnace control built by Lindberg Steel Treating Co.

adapted for special heating applications other than furnaces. The standard time cycle used in the control is one minute. When the indicator is set at 40 per cent, for example, the current is off 36 seconds and on 24 seconds. The elements are turned on and off by means of a mercury switch in the control which is in series with the holding coil of the contactor, in the case of large furnaces, and in series with the elements direct on furnaces of 30 amperes or less.

◆ ◆ ◆

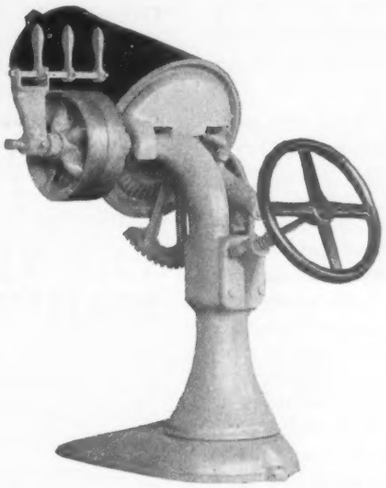
Clutch — Northwest Engineering Co., 28 East Jackson boulevard, Chicago, recently developed a cushion clutch which now is being offered on the larger sizes of shovels, cranes and draglines built by the company. The mechanism is an overload release in the main clutch of the hoist drum. Regardless of how tightly it is adjusted it limits the hoist rope pull to a definite value, the manufacturer declares. In operation the device acts as a cushion against shocks.

◆ ◆ ◆

Shielded Bearings—Bantam Ball Bearing Co., South Bend, Ind., has added to its line of radial bearings, standard S.A.E. No. 203 shielded bearings. The shield retains the lubricant in the bearing and at the same time excludes dust or dirt. This feature is of advantage where a considerable amount of abrasive matter is present. Another recent development by the company in large heavy-duty bearings is a combination of straight rollers and taper rollers. By variation of the various elements, a bearing of this type can be produced that will carry considerable combinations of radial and thrust loads.

◆ ◆ ◆

Tilting Tumbling Barrels—Globe Machine & Stamping Co., 1200-1250 West Fifty-sixth street, Cleveland, has placed on the market a redesigned line of tilting tumbling barrels. Five sizes, small, intermediate and large, are available. The intermediate size embodies models Nos. 2, 3 and 4. Among important innovations in the units, shown herewith, is the patented work-shifting bottom. This is a one-piece casting which fits



Globe tilting tumbling barrel has patented work-shifting bottom

into the bottom of the shell. When the machine is in operation, the work-shifting bottom causes the load to shift forward and backward at the same time the load is agitated sideways in the rotating shell.

A new design of pulley is another feature of the machine. The continuous web construction of this pulley eliminates spokes, which the manufacturer claims automatically removes the possibility of fractures. The redesigned base, stand, gear guard, pulleys and shifter bracket are rugged in construction.

◆ ◆ ◆

Portable Electric Drills—Skilsaw Inc., 3310-20 Elston avenue, Chicago, is introducing a new line of portable electric drills. Ruggedness and fast drilling are features of the tools. Advance type switches are employed; bearings and drive show a distinct change in practice. Bodies are of die cast aluminum which reduces weight and permits many refinements.

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Automatic Blanking Shears—R. H. Brown & Co., New Haven, Conn., is introducing a new line of automatic metal blanking shears to take sheets from 0.010 to 0.162 inch thick and from 4 to 36 inches wide up to 25 feet long. Blanks cut by these units range from ⅛ to 36 inches wide. The machine illustrated herewith takes sheets from 8 to 13 inches wide and up to 24 inches long. As many as 225 sheets of 0.025-inch stock are held in the machine at one time. The only hand operation required is the loading of the magazine; all other operations are performed automatically.

For narrow blanks there is an attachment which stacks the blanks as they are cut. Wearing parts of the machine are made of tool steel hardened and ground to insure long life. Construction is extra heavy to provide strength. The unit is driven by a 1 horsepower geared head motor with a V-belt drive. Table is equipped with a thrust bearing and the bed is reinforced to hold its shape. Speed of the machine is 110 blanks per minute. The gage is adjustable for different size blanks.

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AUTOMATIC blanking shear developed recently by R. H. Brown & Co. It takes sheets from 8 to 13 inches wide and up to 24 inches long

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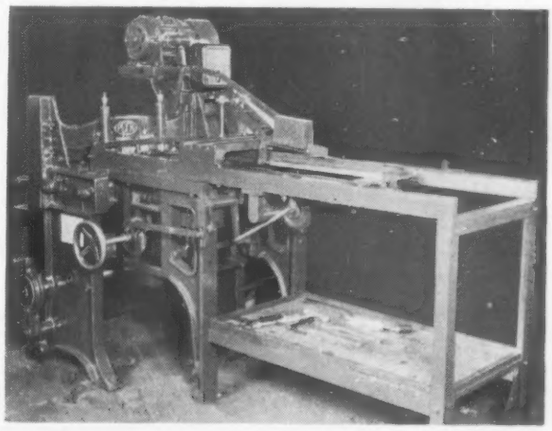

Announcement

of prime interest to the entire Ferrous Industry

● Ferro Carbon-Titanium . . . known as TAM FCT . . . was first made in 1906, at Niagara Falls and by The Titanium Alloy Manufacturing Company. It introduced Titanium to the ferrous industry as something other than a precious metal curiosity. This pioneering TAM FCT, containing about 7.5% carbon, achieved ever increasing popularity and success as the most effective and economical deoxidizer. It will continue to be known as TAM *Original* FCT.

Now ... after 3 years of research ... with the perfection of a new Ferro Carbon-Titanium Alloy,* TAM CO. makes available to the ferrous industry alloy additions capable of accomplishing results heretofore considered impossible in the production of many grades of iron and steel. This new alloy is known as TAM *Low Carbon* FCT and is designed mainly for deep stamping and high finish automobile stock, ingot iron and similar soft steels which finish under 0.06% carbon. It has been proved. It constitutes as important and revolutionary a contribution to metallurgical progress as did TAM Original FCT. The two alloys . . . TAM *Original* FCT and TAM *Low Carbon* FCT . . . offer to the entire steel industry the opportunity of obtaining, for any class of steel or for any grade of work, better, stronger, cleaner and more homogeneous metal . . . and with a higher production yield.

** Patents covering both the alloy and its use have been applied for.*

● In addition to the use of TAM FCT in steels, industry is accomplishing notable results in cast iron with TAM Standard Low-Carbon Ferro-Titanium . . . an addition which insures extreme fineness of the graphite flakes and, consequently, greater strength, increased machinability.

Other TAM Alloys, too, are finding a key position in the "new Order" of product design for both the ferrous and non-ferrous industry, yielding superior finished units at lower production costs. . . To assist you in finding better formulae for your alloy steels or alloy cast irons or many non-ferrous alloys, a complete and experienced TAM Service is at your command. Simply call in a practical TAM Engineer and let him explain.

THE TITANIUM ALLOY MANUFACTURING CO.

Manufacturers of

TAM ZIRCONIUM, TITANIUM PRODUCTS

General Offices and Works:
Niagara Falls, N. Y., U. S. A.
Executive Offices:
111 Broadway, New York City

European Representatives
T. Rowlands & Co., Ltd.
23-27, Broomhall Street
Sheffield, England

Pacific Coast Representatives
Balfour, Guthrie & Co.
San Francisco, Los Angeles, Portland, Seattle, Tacoma, Vancouver, B. C.

"From Locomotive Tires to Beer Kegs"

TAM Metallurgical Alloys enjoy a high position throughout the field of metallurgical research. They have been successfully applied to a wide range of ferrous and non-ferrous problems . . . "from locomotive tires to beer kegs" . . . Rolled, cast and forged steels; cast iron; effervescent and killed steels, forging steels, tires and rail steels, steel castings, stainless and other alloy steels as well as numerous non-ferrous alloys . . . these are the types of applications a TAM Engineer will be glad to discuss with you and your engineers.

TAM *Metallurgical* ALLOYS

Rate Reaches 57, Nearing Last Year's High

Industry Now Concentrating on Production, Placing Deadlines on Releases—Automobile Output Steady—New Railroad Buying, Shape Awards Taper—Scrap Lower

EMPHASIS in the steel industry last week shifted from bookings to production, with the steel rate up two more points to 57 per cent, and indications that this week it will equal the 1933 high of 59 per cent reached last July.

The rate now has risen three consecutive weeks, gaining nine points in that time, and producers do not expect the top of the present movement will be attained much before June. Underlying strength is imparted by the fact that in addition to the leading consumers' requirements for two to three months ahead, now on mill books, all steel users evidently have taken the opportunity to replenish or increase their stocks. Even though tonnages are small in many instances, this has built up a formidable backlog which already is causing producers to fix deadlines for specifications.

Automobile output is close to the spring peak, with approximately 390,000 cars made in April, and this number scheduled for the coming month. Though steel shipments to some plants were suspended last week due to strikes, barring a spread of labor difficulties these are not expected to interfere seriously with production for this quarter. Railroads have about completed their purchasing programs, and building construction is making slow progress.

Consumers Given Privilege of Canceling, While Producers Are Bound To Deliver

It now remains to be seen how much of the steel negotiated prior to recent price advances can be absorbed before July 1. There has been no improvement under the steel code so far as concerns the giving of options to buy—that form of contract universally chosen by consumers extending them the right to cancel any tonnage not wanted, while it binds producers to deliver at specific time and price.

Consumers generally are not making further commitments for the reason the time now is past when they can benefit from lower prices on most products. The advance, however, is not yet 100 per cent effective, as for example in some branches of the industry not yet under codes. New price advances, in addition to those already announced in STEEL, include $3 a ton on rail steel reinforcing bars, and 15 to 25 cents per 100 pounds on steel from warehouses.

Structural shape awards for the week dropped to 11,886 tons from 14,600 tons in the week preceding. Inquiries are out for 50,000 tons for PWA bridges in the Middle West. Seven fabricators shared in an award of 7000 tons of plates, shapes and sheets for seven coast guard cutters. For the government dam at Fort Peck, Mont., 3327 tons of concrete bars have been placed. Miami, Fla., has awarded 8000 tons of cast pipe.

Railroad Buying Lighter; March Steel Exports Highest Since July, 1929, Due to Scrap

Railroad purchases include 6000 tons of plates and shapes by the Delaware, Lackawanna & Western for freight car repairs; 4000 tons of rails by the Nashville, Chattanooga & St. Louis, and reported 500 steel box cars for Chicago Great Western.

Nut and bolt output for the first three months this year was double that of the comparable period last year. A leading eastern automobile body builder reports fabricating 18,500 tons of steel in the first quarter, up from 6000 tons from last year. Armco International Corp. has booked 1000 tons of sheets for Russia.

A few sales of pig iron have been made at the recent price advance of $1 a ton. Jackson county furnaces have raised silveries and bessemer ferrosilicon iron 50 cents a ton. Scrap is easier, STEEL's scrap composite being off 21 cents to $12.

It was due largely to the export of 97,281 tons of scrap in March that the total of iron and steel exports increased 110,085 tons to 261,269 tons, highest of any month since July 1929. March imports, 38,398 tons, were 12,991 tons over February.

Pittsburgh steelworks operations last week rose 3 points to 46 per cent; Chicago 5 to 59; Cleveland 6 to 80; Wheeling 6 to 79; Buffalo 11 to 68; eastern Pennsylvania 1½ to 41½. The Youngstown rate was down 2 to 58. Detroit remained 94; New England 89; Birmingham 52.

STEEL's iron and steel price composite holds at $34.77 and the finished steel index $54.80.

COMPOSITE MARKET AVERAGES

	April 28	April 21	One Month Ago March, 1934	Three Months Ago Jan., 1934	One Year Ago April, 1933	Ten Years Ago April, 1924
Iron and Steel Composite	$34.77	$34.77	$32.40	$32.42	$28.16	$42.33
Finished Steel Composite	54.80	54.80	51.10	51.10	44.94	65.93
Steelworks Scrap Composite	12.04	12.21	12.30	11.24	7.23	14.58

Iron and Steel Composite:—Pig iron, billets, slabs, sheet bars, wire rods, tin plate, nails, sheets, plates, shapes, bars, and black pipe. Finished Steel Composite:—Plates, shapes, bars, hot strip, nails, tin plate, pipe. Steelworks Scrap Composite:—Heavy melting steel and compressed sheets.

A COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

	April 28, 1934	Mar. 1934	Jan. 1934	April 1933
Finished Material				
Steel bars, Pittsburgh	1.90	1.75	1.75	1.60
Steel bars, Chicago	1.95	1.80	1.80	1.70
Steel bars, Philadelphia	2.19	2.04	2.04	1.91
Iron bars, Terre Haute, Ind.	1.60	1.60	1.60	1.65
Shapes, Pittsburgh	1.85	1.70	1.70	1.60
Shapes, Philadelphia	2.05½	1.90	1.90½	1.65
Shapes, Chicago	1.90	1.75	1.75	1.70
Tank plates, Pittsburgh	1.85	1.70	1.70	1.55
Tank plates, Philadelphia	2.03½	1.88½	1.88½	1.49½
Tank plates, Chicago	1.90	1.75	1.75	1.70
Sheets, No. 10, hot rolled, Pitts.	2.00	1.75	1.75	1.55
Sheets, No. 24, hot ann., Pitts.	2.65	2.25	2.25	2.00
Sheets, No. 24, galvan., Pitts.	3.25	2.85	2.85	2.65
Sheets, No. 10, hot rolled, Gary	2.10	1.85	1.85	1.70
Sheets, No. 24, hot anneal., Gary	2.75	2.35	2.35	2.10
Sheets, No. 24, galvan., Gary	3.35	2.95	2.95	2.75
Plain wire, Pittsburgh	2.30	2.20	2.20	2.10
Tin plate, per base box, Pitts.	5.25	5.25	5.25	4.25
Wire nails, Pittsburgh	2.60	2.35	2.35	1.85
Semifinished Material				
Sheet bars, open-hearth, Youngs.	30.00	26.00	26.00	26.00
Sheet bars, open-hearth, Pitts.	30.00	26.00	26.00	26.00
Billets, open-hearth, Pittsburgh	29.00	26.00	26.00	26.00
Wire rods, Pittsburgh	38.00	36.00	36.00	35.00

	April 28, 1934	Mar. 1934	Jan. 1934	April 1933
Pig Iron				
Bessemer, del. Pittsburgh	19.76	19.26	19.26	16.26
Basic, Valley	18.00	17.00	17.00	14.00
Basic, eastern, del. eastern Pa.	19.76	18.76	18.76	14.19
No. 2 foundry, del. Pittsburgh	19.26	18.76	18.76	15.76
No. 2 foundry, Chicago	18.50	17.50	17.50	15.50
Southern, No. 2, Birmingham	14.50	13.50	13.50	11.40
No. 2X, Eastern, del. Philadelphia	20.63	19.63	19.63	13.76
Malleable, Valley	18.50	17.50	17.50	14.50
Malleable, Chicago	18.50	17.50	17.50	15.50
Lake Superior charcoal, del. Chi.	23.54	23.54	23.54	23.04
Gray forge, del. Pittsburgh	18.88	18.38	18.38	15.63
Ferromanganese, del. Pittsburgh	90.24	90.24	90.24	73.24
Scrap				
Heavy melting steel, Pittsburgh	$13.75	14.30	13.05	9.90
Heavy melting steel, eastern Pa.	11.50	11.70	11.65	6.90
Heavy melting steel, Chicago	11.75	12.00	10.45	6.55
No. 1 wrought, eastern Pa.	12.25	12.75	12.75	7.35
No. 1 wrought, Chicago	10.90	10.80	9.45	5.50
Rails for rolling, Chicago	12.75	12.75	11.25	8.50
Coke				
Connellsville, furnace, ovens	3.25	3.35	3.60	1.75
Connellsville, foundry, ovens	4.60	4.25	4.25	2.25

Steel, Iron, Raw Material and Metals Prices

Prices conform to American Iron and Steel institute schedules. Asterisks denote price changes this week

Sheet Steel

HOT ROLLED No. 10
(24 to 48 inches wide)

Pittsburgh, base	2.00c
Gary, base	2.10c
Chicago, del.	2.13c
New York, del.	2.33c
Philadelphia, del.	2.29c
Birmingham, base	2.15c
St. Louis, del.	2.32c
F.o.b. cars, dock, Pacific ports	2.67½c

HOT ROLLED ANN. No. 24

Pittsburgh, base	2.65c
Gary, base	2.75c
Chicago, del.	2.78c
Detroit, del.	2.85c
New York, del.	2.98c
Philadelphia, del.	2.94c
Birmingham, base	2.80c
St. Louis, del.	2.97c
F.o.b. cars, dock, Pacific ports	3.35c

GALVANIZED No. 24

Pittsburgh, base	3.25c
Gary, base	3.35c
Chicago, del.	3.38c
Philadelphia, del.	3.54c
New York, del.	3.58c
Birmingham, base	3.40c
St. Louis, del.	3.57c
San Francisco, f.o.b. cars, dock	3.95c

TIN MILL BLACK No. 28

Pittsburgh, base	2.85c
Gary, base	2.95c
St. Louis, del.	3.17c

COLD ROLLED No. 10

Pittsburgh, base	2.55c
Gary, base	2.65c
Detroit, delivered	2.75c
Philadelphia, del.	2.84c
New York, del.	2.88c

COLD ROLLED No. 20

Pittsburgh, base	3.15c
Gary, base	3.25c
Detroit, delivered	3.35c
Philadelphia, del.	3.44c
New York, del.	3.48c

ENAMELING SHEETS

Pittsburgh, No. 10	2.60c
Pittsburgh, No. 20	3.20c

Tin and Terne Plate

Per 100-lb. box, Pittsburgh. Gary base, 10 cents higher

Tin plate, coke base contract	$5.25
Do., stock	4.90c
Long ternes, No. 24 unassorted	3.65c

Corrosion and Heat Resistant Alloys

Base, Pittsburgh

18% chrome, 8% nickel; sheets, 35c; plates, 28c; bars, 24c; hot-rolled strip, 24.50c; cold-rolled strip, 32.00c.

	A	B	C	D
Bars	17c	18.5c	21c	26c
Plates	20c	21.5c	24c	29c
Sheets	25c	28c	31c	35c
Hot strip	17c	18.5c	21c	26c
Cold strip	22.5c	24c	27c	35c

Carbon 0.12 and under; no nickel. A has chrome 15% and under. B over 15/18% inc., C over 19/23% inc., D over 23/30%.

Steel Plates

Pittsburgh, base	1.85c
New York, del.	2.13c
Philadelphia, del.	2.03½c
Boston, del.	2.25c
Buffalo, del.	2.08½c
Chicago, base	1.90c
Cleveland, del.	2.03½c
Birmingham, base	2.00c
Coatesville, base	1.95c
Sparrows Pt., base	1.95c
Pacific Coast, f.o.b. cars, dock	2.40c
St. Louis, del.	2.12c

Structural Shapes

Pittsburgh, base	1.85c
Philadelphia, del.	2.05½c
New York del.	2.10½c
Boston, del.	2.23½c
Bethlehem, base	1.95c
Chicago, base	1.90c
Cleveland, del.	2.03½c
Buffalo, base	1.90c
Birmingham, base	2.00c
Pacific Coast, f.o.b. cars, dock	2.40c

Bars

SOFT STEEL

Pittsburgh, base	1.90c
Chicago base	1.95c
Birmingham, base	2.05c
Buffalo, base	2.00c
Cleveland, base	1.95c
Detroit, del.	2.05c
Pacific Coast ports cars, dock, c.i.f.	2.45c
Philadelphia, del.	2.19c
Boston, del.	2.30c
New York, del.	2.23c
Pitts., forg. qual	2.05c-2.55c

RAIL STEEL
To Manufacturing Trade

Pittsburgh	1.80c
Chicago	1.85c
Cleveland	1.85c
Gary, Ind.	1.85c
Buffalo	1.90c

IRON

Terre Haute, Ind. base	1.60c
*Philadelphia, base	1.99c
Pittsburgh, refined	2.75c-7.50c

REINFORCING
New billet, cut lengths, carlots

*Pittsburgh	2.05c
*Chicago, Gary, Buffalo, Cleve., Birm., Young	2.10c
*Gulf ports	2.45c
*Pacific coast ports	3.00c
*Philadelphia, del.	2.34c

Rail Steel

Pittsburgh, base	1.75c
Chicago, Buffalo, Cleveland, Birm., Young	1.80c
Gulf ports	2.15c
Pacific coast ports	2.30c

Wire Products □ □

(Prices apply to straight or mixed carloads; pool cars, or less, 10c up. 10% dis. on nail extras on straight or mixed carloads to one consignee.)

Base, Pittsburgh-Cleveland
(Per 100-lb. keg)

Standard wire nails	$2.60
Cement coated nails	2.60
Galvanized nails, 15 gage and coarser	4.60c
Do., 16 gage and finer	5.10c

(Per pound)

Polished staples	3.30c
Galvanized fence staples	3.55c
Barbed wire, galv.	3.00c
Annealed fence wire	2.50c
Galvanized fence wire	2.85c
Woven wire fencing (base column, c.l.)	$63.00
Plain wire, 6-9 gage to mfg. trade	2.30c

Anderson, Ind., Chicago up $1; Duluth up $2; Birmingham up $3.

Spring wire	3.20c

Chicago and Waukegan $1 higher, Worcester $2 higher.

Cold-Finished Carbon Bars

Base Pitts., one size, shape, grade, shipment at one time to one destination

10,000 to 19,999 lbs.	2.10c
20,000 to 59,999 lbs.	2.05c
60,000 to 99,999 lbs.	2.00c
100,000 lbs. and over	1.97½c

Chicago, Cleveland, up 5c; Buffalo, up 10c; Detroit, up 20c; eastern Michigan, up 25c.

Shafting □ □ □

Turned and ground, Pitts. base	
1⅛-inch	3.40c
1⅜ to 1½-inch	2.90c
1⅝ to 1⅞-inch	2.75c
1⅛ to 2⅞-inch	2.60c
2⅛ to 7-inch	2.45c

Alloy Steel Bars □

Hot Rolled

Pittsburgh, Buffalo, Chicago, Massillon, Canton, Bethlehem	2.55c

S.A.E.	Alloy Diff.	S.A.E.	Alloy Diff.
2000	0.25	3100	0.55
2100	0.55	3200	1.35
2300	1.50	3300	3.80
2500	2.25	3400	3.20

4100 .15 to .25 Mo	0.50
4600 .20 to .30 Mo. 125-1.75 Ni.	1.05
5100 .80-1.10 Cr.	0.45
5100 Cr. spring	base
6100 bars	1.20
6100 spring	0.70
Cr., Ni., Van.	1.50
Carbon van.	0.95
9250.....carbon base plus extras	

Strip and Hoops □

Hot strip to 23⅞-in.	
Pittsburgh	2.00c
Do., Chicago	2.10c
Do., del. Detroit	2.20c
Do., del. Phila.	2.29c
Do., del. N. Y.	2.33c
Cooperage hoop,	
Pittsburgh	2.10c
Do., Chicago	2.20c
Cold-rolled strip,	
Pitts., Cleve.	2.80c
Worcester	3.00c

Rails, Track Material □

(Gross Tons)

Standard rails, mill	$36.37½
Relay rails, Pitts.	
24-45 lbs.	$26.00
50-60 lbs.	$23.00
70-75 lbs.	$18.00
80-85 lbs.	$25.00
100 lbs.	$26.00
Light rails, billet	
* qual., Pitts., Chi.	$35.00
* Do., reroll. qual.	$34.00
Angle bars, mills	2.55c
Spikes, R. R. base	2.40c
Track bolts, base	3.55c
Tie plates, base	1.90c

Base, light rails 25 to 40 lbs.; 50 to 60 lbs. inclusive up $5; 16 and 20 lbs., up $1; 12 lbs., up $8; 8 and 10 lbs., up $5. Base railroad spikes 200 kegs or more; base tie plates 20 tons or more; diff. for less.

Bolts and Nuts □ □

Pittsburgh, Cleveland, Birmingham, Chicago. Discounts to legitimate trade for all case lots. Dec. 1, 1932, lists.

CARRIAGE BOLTS

All sizes, cut thread	70 off
Rolled thread, ½ x 6 and smaller	70 off

MACHINE BOLTS
All sizes, cut thread, lag

Screws, plow bolts, Nos. 1-2-3-7 heads, tap bolts, blank bolts, stud bolts, without nuts	70 off
Tire bolts	60 off
Stove bolts, 70-25-10 off in pkgs.; 83 off in bulk, 5000 or more of a size.	
Rolled thread machine bolts, ½ x 6 and smaller,	70 off
Step bolts	66 off
Elevator bolts	66 off

NUTS

Semifinished	70 off

HEXAGON CAP SCREWS

Milled	80-10-10 off
Upset 1-in., smaller	85 off

SQUARE HEAD SET SCREWS

Upset, 1-in., smaller	75-10 off
Upset, larger than 1-in.	75-10 off
Headless set screws	75 off

Rivets, Wrought Washers

Struc., c. l., Pittsburgh, Cleveland	3.00c
Struc., c. l., Chicago	3.10c
⅞-in. and smaller, Pitts., Chi., Cleve.	70 and 5 off
Wrought washers, Pitts., Chi., Phila.	6.25 off

Cut Nails, Piling □

Cut nails, Pitts.; (10% discount on size extras)	$2.75
Do. less carloads, 5 kegs or more, no discount on size extras	$3.05
Do. less than 5 kegs; no discount on size extras	$3.20
Steel piling, Pittsburgh	2.15c
Steel piling, Chi., Buff.	2.25c

Pipe and Tubing

Base $200 net ton, except on standard commercial seamless boiler tubes under 2 inches and cold drawn seamless tubing.

Welded Iron, Steel Pipe

Base discounts on steel pipe, Pitts., Lorain, O., to consumers in carloads. Gary, Ind., 2 points less. Chicago delivered 2½ points less. Wrought pipe, Pittsburgh base.

BUTT WELD
Steel

In.	Blk.	Gal.
*¼ and ⅜	53½	35
*½	58½	47
*¾	62	52
*1—3	64	55

Iron

½	31½	15
¾	36½	20½
1—1¼	39½	25½
2	41½	26

LAP WELD
Steel

*2	60	51
*2½—3	63	54
*3½—6	65	56
*7 and 8	64	54
*9 and 10	63½	53½

Iron

2	37	22½
2½—3½	38	25
4—8	40	28½

LINE PIPE
Steel

⅛-inch, butt weld	50½
*¼—⅜, butt weld	52½
*½, butt weld	57½
*¾, butt weld	61
*1—3, butt weld	63
*2-inch, lap weld	59
*2½—3, lap weld	62
*3½—6, lap weld	64
*7—8, lap weld	63

Iron

⅛—1½-inch, black and galv. take 4 pts. over; 2½—6-inch 2 pts. over discounts for same sizes, standard pipe lists. 8—12-inch, no extra.

BOILER TUBES
C. L. Discounts, f.o.b. Pitts.

Lap Weld Steel		Charcoal Iron	
2—2¼	33	1¾	8
2½—2¾	40	2—2¼	13
3	47	2½—2¾	16
3¼—3½	50	3	17
4	52	3¾—3½	18
4½—5	42	4	20
		4½	21

In lots of a carload or more, above discounts subject to preferential of two 5% and one 7½% discount on steel and 10% on charcoal iron.

Lapwelded steel: 2000 to 9999 pounds, ten points under base, one 5% and one 7½%. Under 2000 pounds 15 points under base, one 5% and one 7½%. Charcoal iron: 10,000 pounds to carloads, base less 5%; under 10,000 pounds, two points under base only.

SEAMLESS BOILER TUBES
Cold Drawn

2—2¼	27	3¼—3½	41
2½—2¾	34	4	43
3	38	4½, 5, 6	36

(On 1—1¾-inch sizes mechanical tubing dis. apply.)
Hot Rolled

2—2¼	33	3¼—3½	47
2½—2¾	40	4	49
3	44	4½, 5, 6	42

Quantity discounts: Carload and more gets preferentials of two 5%; 2000 to 999 pounds, 10 points off base and one 5%, under 2000 pounds, 15 points under base and one 5%.

Seamless Tubing □

Cold drawn; f.o.b. mill disc.

100 ft. or 150 lbs.	32%
15,000 ft. or 22,500 lbs.	70%

Cast Iron Water Pipe □

Class B Pipe—Per Net Ton

6-in., & over, Birm.	$36.00-37.00
4-in., Birmingham	39.00-40.00
4-in., Chicago	47.00-48.00
6 to 24-in., Chicago	44.00-45.00
6-in., & over, east. fdy.	40.00
Do., 4-in.	43.00

Class A pipe $3 over Class B.

Stnd. fitgs., Birm. base	$90.00

Six to 24-inch, fittings, base; over 24-inch plus $20; 4-inch, plus $10; 3-inch, plus $20; gas pipe fittings, 5 higher.

Semifinished Steel □

Prices Per Gross Ton

BILLETS AND BLOOMS
4 x 4-inch base

Pitts., Chi., Cleve., open-hth. & bess.	$29.00
Philadelphia	34.30
Forging, Pitts., Chi.	34.00

SHEET BARS

Pitts., Cleve., Young.	30.00
Chicago	30.00
Canton, O.	30.00

SLABS

Pitts., Cleve., Young.	29.00

WIRE RODS

Pitts., Cleveland	38.00
Chicago	39.00

SKELP

All grades, Pitts. and Chicago	1.70c

Coke □ □ □

Price Per Net Ton

BEEHIVE OVENS

Connellsville fur†	$3.25- 3.85
Connellsville fdry	4.60
Connell. prem. fdy	5.35
New River fdry	6.00
Wise county fdry	4.25- 5.00
Wise county fur	3.50- 4.25

†Lower prices for yearly contracts.

BY-PRODUCT FOUNDRY

Newark, N. J., del.	8.71- 9.31
Chi., ov., outside del.	8.50
Chicago, del.	9.25
New England, del.	10.50
St. Louis, del.	9.25
Birmingham, ovens	5.50
Indianapolis, del.	8.75
Cincinnati, del.	9.30
Cleveland, del.	9.25
Buffalo, ovens	7.50- 8.00
Detroit, ovens	8.50
Philadelphia, del.	9.00

Coke By-Products □

Per gallon, producers' plants.

Tank lots

	Spot
Pure benzol	$0.19
90 per cent benzol	$0.19
Toluol	0.30
Solvent naphtha	0.26
Commercial xylol	0.26

Per lb. f.o.b. New York

Phenol (200 lb. drums)	0.163c
Do. (100 lbs.)	0.173c

Eastern Plants, Per Pound, In Barrels

†Naphthalene flakes and balls	6.00

Per 100 lb. Atlantic seaboard

Sulphate of ammonia	$1.25

†Western prices ½-cent up.

Pig Iron

Delivered prices do not include switching charges except as noted. No. 2 foundry iron is 1.75-2.25 silicon; 25-cent differentials apply for each 0.25 silicon above 2.25. Gross tons.

	No. 2 Fdry.	Malleable	Basic	Bessemer
Basing Points:				
Bethlehem, Pa.	$19.50	$20.00	$19.00	$20.50
Birdsboro, Pa.	19.50	20.00	19.00	20.50
Swedeland, Pa.	19.50	20.00	19.00	20.50
Sparrows Point, Md.	19.50	.....	19.00	.....
From Swedeland, Pa., del. to Phila.	20.26	20.76	19.76	.....
From Bethlehem, del. to Brooklyn	21.77	22.27	.....	.....
From Bethlehem, del. to Newark, N. J.	20.99	21.39	.....	.....
Basing Point:				
Everett, Mass.	19.50	20.00	19.00	20.50
From Everett, del. to Boston	20.00	20.50	19.50	21.00
Basing Point:				
Buffalo	18.50	19.00	17.50	18.50
From Buffalo, del. to Boston	20.00	20.50	19.50	21.00
Basing Points:				
Neville Island, Pa.	18.50	18.50	18.00	19.00
Sharpsville, Pa.	18.50	18.50	18.00	19.00
Youngstown, O.	18.50	18.50	18.00	19.00
From Neville Island, Pa., del. to Pittsburgh district	(Neville Island base, plus 63c to $1.13 switching charges)			
Basing Points:				
Erie, Pa.	18.50	19.00	18.00	19.50
Cleveland	18.50	18.50	18.00	19.00
Toledo, O.	18.50	18.50	18.00	19.00
Detroit	18.50	18.50	18.00	19.00
From Detroit, del. to Saginaw, Mich.	20.60	20.60	20.10	21.10
From Cleveland, del. to Akron, Canton, O.	19.76	19.76	19.26	20.26
From Toledo, del. to Mansfield, O.	20.26	20.26	19.76	20.76
Basing Point:				
Jackson, O.	20.25	20.25	19.75	.....
Hamilton, O.	18.50	18.50	18.00	.....
From Hamilton, del. to Cincinnati	19.51	19.51	19.01	20.01
Do., del. to Indianapolis	20.77	20.77	20.27	21.27
Basing Points:				
Duluth	19.00	19.00	.....	19.50
Chicago	18.50	18.50	18.00	19.00
Granite City, Ill.	18.50	19.00	18.00	.....
From Duluth, del. to St. Paul	20.94	20.94	.....	21.44
From Chicago, del. to Milwaukee	19.50	19.50	19.00	20.00
From Chicago, Toledo or Detroit, del. to Muskegon, Mich.	21.40	21.40	20.90	21.90
From Granite City, del. to St. Louis	19.00	19.50	18.50	.....
Basing Point:				
†Birmingham, Ala.	14.50	.....	13.50	19.00
From Birmingham, del. to:				
Boston	19.62	.....	19.50	.....
Newark, N. J.	20.58	.....	.....	.....
Brooklyn, N. Y.	21.39	.....	.....	.....
Baltimore	20.02	.....	19.90	.....
Philadelphia	19.88	.....	19.76	.....
Cleveland	18.62	.....	18.50	.....
Cincinnati	19.13	.....	18.51	.....
Chicago	††18.72	.....	18.60	.....
St. Louis	18.62	.....	18.50	.....

†Southern delivery only. Prices at northern points are adjusted to quotations on northern iron. ††Over 0.70 phos.

Basing Point:	
*Provo, Utah	17.50

LOW PHOS.

Basing Points: Birdsboro, Pa., Steelton, Pa., and Standish, N. Y.—$23.50. Basing Point: †Johnson City, Tenn.—$23.50

†Off grade material is $19.50

Philadelphia, standard and copper bearing	24.13

GRAY FORGE		CHARCOAL	
Valley furnace	17.25	*Lake Superior fur.	21.00
Pitts. dist. fur.	17.75	*Do., del. Chicago	24.04

SILVERY

Jackson County, O., base; 6%—$22.25; 7—$23.25; 8—$24.25; 9—$25.25; 10—$26.25; 11—$27.75.

BESSEMER FERROSILICON

Jackson County, O., base; 10%—$27.25; 11—$28.75; 12—$30.25; 13—$31.75; 14—$33.25; 15—$34.75; 16—$36.25.

Iron Ore

LAKE SUPERIOR ORE
Gross ton, 51½% Lower Lake Ports

Old range bessemer	$4.80
Mesabi nonbess.	4.50
High phosphorus	4.40
Mesabi bessemer	4.65
Old range nonbess.	4.65

EASTERN LOCAL ORES
Cents, unit, del. E. Pa.

Foundry and basic, 56-63% con. (nom.)	8.00- 9.00
Cop.-free low phos. 58-60% (nom.)	10.00-10.50

FOREIGN ORE
Cents per unit, f.a.s. Atlantic ports (nominal)

Foreign manganiferous ore, 45.55% iron, 6-10% man.	10.00
No. Afr. & low phos.	9.50
Swedish basic, 65%	9.00
Swedish low phos.	9.50
Spanish No. Africa basic, 50 to 60%..	9.00
*Tungsten, spot, sh. ton unit, duty pd.	$17.25-17.75
N. F. fdy., 55%.....	7.00
Chrome ore, 48% gross ton, c.i.f.....	$18.00

Manganese Ore

(Nominal)

Prices, not including duty, cents per unit, cargo lots.

Caucasian, 52-55%	24.00
So. African, 52%....	24.00
So. Afr., 49-51%....	22.00
Indian, 58-50%	nominal
Indian, 48-50%	nominal

Refractories

Per 1000 f.o.b. Works

FIRE CLAY BRICK
First Quality

Pa., Ill., Ky., Md., Ga., Mo.	$45.00
Alabama	48.00

Second Quality

Pa., Ill., Ky., Md., Mo., Ga., Ala.	40.00

Ohio

First quality	$40.00
Intermediary	36.00
Second quality	25.00

MALLEABLE BUNG BRICK	
All bases	50.00
SILICA BRICK	
Pennsylvania	$45.00
Joliet, E. Chicago	54.00
Birmingham, Ala.	52.00
MAGNESITE	
Dead burned grain, Chester, Pa., Baltimore bases, net	40.00
Domes, Chewelah, Wash., base	22.00

BASIC BRICK
Net ton, f.o.b. Baltimore, Plymouth, Meeting, Pa., Chester, Pa.

Magnesite brick	$65.00
Chrome brick	45.00
Chemically bonded magnesite	55.00

Fluorspar, 85-5

Washed gravel, duty paid, tide, net ton	$19.00
Washed gravel, f.o.b. Ill., Ky., net ton, carloads	$17.00

Ferroalloys

Dollars, except Ferrochrome

Ferromanganese, 78-82% tidewater, duty paid	85.00
del. Pittsburgh	90.24
Spiegeleisen, 19-20%, dom. fur. spot†	26.00
Ferrosilicon 50%, freight all., cl.	77.50
Do., less carload	85.00
Do., 75 per cent	126-130.00
Spot, $5 a ton higher.	
Silicomang., 2½ carb.	90.00
2% carbon	95.00
1% carbon	105.00
Ferrochrome, 66-70 chromium, 4-6 carbon, cts. lb. con. del.	10.00
*Ferrotungsten, stand., lb. cont. del.	1.35- 1.45
Ferrovanadium, 35 to 40% lb., cont., on analysis	2.70- 2.90
Ferrotitanium, c. l., prod. plant, frt. allow., net ton	137.50
Spot, 1 ton, frt., allow., lb.	7.00
Do., under 1 ton	7.50
Ferrophosphorus, per ton, c. l., 17-19%, Rockdale, Tenn., basis, 18%, $2 unitage	50.00
Ferrophosphorus, electrolytic, per ton c. l., 23-26% f.o.b. Anniston, Ala., 24% $2.75 unitage	65.00
Ferromolybdenum, stand. 50-60%, lb.	0.95
Molybdate, lb. cont.	0.80

†Carloads, Quan. diff. apply.

Nonferrous Mill Products

F.o.b. mill base, cents per lb. except as specified. Copper, brass products based on 8.50c *Conn. copper*

Sheets	
Yellow brass (high)	14.25
Copper, hot rolled	15.50
Lead, cut, to jobbers	8.00
Zinc, 100-lb. base	9.00
Tubes and Pipes	
High yellow brass	16.75
Seamless copper	16.75
Rods	
High yellow brass	12.75
Copper, hot rolled	12.75
Anodes	
Copper untrimmed	13.25
Wire	
Yellow brass (high)	14.75

Old Metals

Deal, buying prices, cents lb.

No. 1 Composition Red Brass	
New York	4.87½-5.12½
Chicago	5.12½-5.37½
Cleveland	5.50- 6.00
St. Louis	5.25- 5.50
Heavy Copper and Wire	
New York	6.50- 6.62½
Chicago No. 1	6.37½-6.62½
Cleveland	6.25- 6.75
St. Louis	6.25- 6.50
Composition Brass Borings	
New York	4.62½-4.87½
Light Copper	
New York	5.62½-5.87½
Chicago	5.12½-5.37½
Cleveland	5.50- 6.00
St. Louis	5.50- 5.75
Light Brass	
Chicago	3.12½-3.37½
Cleveland	3.25- 3.50
Lead	
New York	3.12½-3.37½
Cleveland	3.25- 3.50
Chicago	3.00- 3.25
St. Louis	3.35- 3.50
Zinc	
New York	2.25- 2.50
Cleveland	2.25- 2.75
St. Louis	2.75-3.00
Aluminum	
Clips, soft, Cleve.	13.00-14.50
Borings, Cleveland	7.00- 7.50
Mixed, cast, Cleve.	11.00-11.25
Mixed, cast, St. L.	11.75-12.00

Secondary Metals

Brass ingot, 85-5-5-5	8.75
*Remelt al. No. 12	14.50-16.00

Iron and Steel Scrap Prices

Corrected to Friday night. Gross tons delivered to consumers, except where otherwise stated

HEAVY MELTING STEEL

Birmingham	11.50-12.50
Boston, dealers	7.50- 7.75
Buffalo, No. 1	12.50-13.00
Buffalo, No. 2	11.00-11.50
Chicago, No. 1	11.50-12.00
Cleveland, No. 1	11.50-12.00
Cleveland, No. 2	11.00-11.50
Detroit, No. 1	9.50-10.00
Detroit, No. 2	8.50- 9.00
Eastern Pa.	11.50
Eastern Pa., No. 2	9.50
Federal, Ill.	8.50- 9.00
Granite City, R. R.	8.75- 9.25
Granite City, No. 2	8.00- 8.50
N. Y., deal. R. R.	9.50
N. Y., deal. No. 2	8.00
Pittsburgh, No. 1	13.50-14.00
Valleys, No. 1	14.00

COMPRESSED SHEETS

Buffalo, dealers	11.00-11.50
Chicago, factory	10.50-11.00
Cleveland	11.00-11.50
Detroit	9.50-10.00
E. Pa., new mat.	10.50-11.00
Pittsburgh	13.25-13.75
St. Louis	8.50- 9.00
Valleys	13.50

BUNDLED SHEETS

Buffalo	7.50- 8.00
Cincinnati, del.	8.00- 8.50
Cleveland	8.50- 9.00
Pittsburgh	12.00-12.50
St. Louis	5.50- 6.00

SHEET CLIPPINGS LOOSE

Chicago	6.50- 7.00
Cincinnati	7.50- 8.00
Detroit	5.50- 6.00
St. Louis	5.75- 6.25

STEEL RAILS, SHORT

Birmingham	12.00-12.50
Boston, dealers	7.50- 7.75
Buffalo	14.00-14.50
Chicago (3 ft.)	12.50-13.00
Chicago (2 ft.)	13.00-13.50
Cincinnati, del.	13.00-13.50
Detroit	11.50-12.00
Pitts., open-hearth, 3 ft. and less	16.00-16.50
St. Louis, 2 ft. & less	12.50-13.00

STEEL RAILS, SCRAP

Pittsburgh	13.50-14.00

STOVE PLATE

Birmingham	7.00- 7.50
Boston, dealers	4.75- 5.00
Buffalo	10.75-11.00
Chicago, net	7.75- 8.25
Cincinnati, dealers	7.00- 7.50
Detroit, net	7.50- 8.00
Eastern Pa.	8.50- 9.00
N. Y., deal. fdry.	6.00
St. Louis	6.75- 7.25

COUPLERS, SPRINGS

Buffalo	13.75-14.25
Chicago, springs	12.50-13.00
Eastern Pa.	15.50
Pittsburgh	16.00-16.50
St. Louis	9.00- 9.50

ANGLE BARS—STEEL

Chicago	12.50-13.00
St. Louis	9.50-10.00

LOW PHOSPHORUS

Buffalo, billets and bloom crops	14.00-14.50
Cleveland, billet, bloom crops	14.00-14.50
Eastern Pa. crops	14.00-14.50
Pittsburgh, billet, bloom crops	16.50-17.00
Pittsburgh, sheet bar crops	15.50-16.00

FROGS, SWITCHES

Chicago	11.50-12.00
St. Louis, cut	9.50-10.00

SHOVELING STEEL

Chicago	11.50-12.00
Federal, Ill.	7.75- 8.25
Granite City, Ill.	8.75- 9.25

RAILROAD WROUGHT

Birmingham	6.50- 7.50
Boston, dealers	6.00- 6.50
Buffalo, No. 1	9.50-10.00
Buffalo, No. 2	12.50-13.00
Chicago, No. 1, net	9.50-10.00
Chicago, No. 2	11.50-12.00
Cincinnati, No. 2	9.50-10.00
Eastern Pa.	12.00-12.50
N. Y., No. 1 deal.	8.50- 9.00
St. Louis, No. 1	6.50- 7.00
St. Louis, No. 2	8.75- 9.25

SPECIFICATION PIPE

Boston	4.50- 4.75
Eastern Pa.	9.50
New York, dealers	5.25- 5.50

BUSHELING

Buffalo, No. 1	11.00-11.50
Chicago, No. 1	10.50-10.75
Cinci., No. 1 deal.	7.50- 8.00
Cincinnati, No. 2	5.00- 5.50
Cleveland, No. 2	8.75- 9.25
Detroit, No. 1 new	8.50- 9.00
Valleys, new No. 1	13.50

MACHINE TURNINGS

Bimingham	4.50- 5.00
Boston, dealers	3.75- 4.00
Buffalo	6.25- 6.50
Chicago	7.00- 7.50
Cincinnati, dealers	6.00- 6.50
Cleveland	8.75- 9.25
Detroit	6.50- 7.00
Eastern Pa.	7.50
New York, dealers	3.25- 3.50
Pittsburgh	9.50-10.00
St. Louis	4.25- 4.75
Valleys	11.50

BORINGS AND TURNINGS

For Blast Furnace Use

Boston, dealers	3.25- 3.50
Buffalo	7.75- 8.25
Cincinnati, dealers	6.00- 6.50
Cleveland	8.75- 9.25
Detroit	7.25- 7.75
Eastern Pa.	6.50
New York, dealers	2.00- 2.50
Pittsburgh	9.00

CAST IRON BORINGS

Birmingham, plain	4.50- 5.00
Boston, chemical	8.50- 9.00
Boston, dealers	3.25- 3.50
Buffalo	7.50- 8.00
Chicago	7.50- 8.00
Cincinnati, dealers	6.00- 6.50
Cleveland	8.75- 9.25
Detroit	7.25- 7.75
E. Pa., chemical	12.00-15.00
New York, dealers	3.00- 3.50
Pittsburgh	8.50- 9.00
St. Louis	4.50- 5.00

PIPE AND FLUES

Cincinnati, dealers	5.00- 5.50

RAILROAD GRATE BARS

Buffalo	7.00- 7.50
Chicago, net	7.50- 8.00
Cincinnati	6.00- 6.50
Eastern Pa.	9.00
New York, dealers	5.00- 5.50
St. Louis	6.00- 6.50

FORGE FLASHINGS

Boston, dealers	6.00- 6.50
Buffalo	11.00-11.50
Cleve., over 10 in.	9.25- 9.75
Detroit	8.50- 9.00

FORGE SCRAP

Boston, dealers	5.00- 6.00
Chicago, heavy	12.50-13.00
Eastern Pa.	10.50-11.00

ARCH BARS, TRANSOMS

St. Louis	11.00-11.50

AXLE TURNINGS

Boston, dealers	4.50- 5.00
Buffalo	9.00- 9.50
Chicago, elec. fur.	10.50-11.00
Cleveland	9.25- 9.75
Eastern Pa.	11.00
St. Louis	7.50- 8.00

STEEL CAR AXLES

Birmingham	10.00-11.00
Boston, ship, point.	9.00- 9.50
Buffalo	13.00 13.50
Chicago, net	12.00-12.50
Eastern Pa.	14.00
St. Louis	9.50-10.00

SHAFTING

Boston, ship. point.	11.00-11.25
Eastern Pa.	16.25
New York, dealers	11.50-12.00
St. Louis	13.00-13.50

CAR WHEELS

Birmingham, iron	9.50-10.00
Boston, iron deal.	6.50- 6.75
Buffalo, iron	12.25-12.75
Buffalo, steel	13.75-14.25
Chicago, iron	12.00-12.50
Chicago, rolled steel	12.50-13.00
Cincinnati, iron	10.25-10.50
Eastern Pa., iron	13.50-14.00
Eastern Pa., steel	15.00-15.50
Pittsburgh, iron	13.00-13.50
Pittsburgh, steel	16.00-16.50
St. Louis, iron	9.00- 9.50
St. Louis, steel	9.00- 9.50

NO. 1 CAST SCRAP

Birmingham	9.00-10.00
Boston, No. 2	5.50- 6.00
Boston, tex. con.	10.50-11.00
Buffalo, cupola	11.50-12.00
Buffalo, mach.	12.00-12.50
Chicago, agri. net	8.25- 8.75
Chicago, mach. net	9.25- 9.75
Chi., railroad net	9.00- 9.50
Cinci., mach. cup	10.75-11.25
Cleveland, cupola	13.00-13.50
Detroit, net	9.50-10.00
Eastern Pa., cupola	12.50-13.00
Pittsburgh, cupola	12.75-13.25
San Francisco, del.	13.50-14.00
Seattle	7.00- 8.50
St. Louis, No. 1	8.25- 8.75
St. L., No. 1 mach.	10.00-10.50

HEAVY CAST

Boston, del.	6.75- 7.00
Buffalo, break.	9.00- 9.50
Cleveland, break.	8.50- 9.00
Detroit, break.	8.00- 8.50
Detroit, auto net	11.00-11.50
Eastern Pa.	11.50-12.00
N. Y., No. 1, deal.	8.00- 8.50
N. Y., break. deal.	8.00- 8.50
Pittsburgh	11.75-12.25

MALLEABLE

Boston, consum.	12.50-13.00
Buffalo	13.25-13.75
Chicago, R. R.	12.00-12.50
Cincinnati, agri. del.	9.75-10.25
Cinci., R. R. del.	10.50-11.00
Cleveland, rail.	13.50-14.00
Detroit, auto	9.75-10.25
St. Louis, R. R.	9.50-10.00
Eastern Pa., R. R.	11.50-12.50

RAILS FOR ROLLING

5 feet and over

Birmingham	10.50-11.50
Boston, dealers	7.50- 7.75
Buffalo	12.00-12.50
Chicago	12.50-13.00
Eastern Pa.	13.00
New York, dealer	8.00- 8.50
St. Louis	10.00-10.50

LOCOMOTIVE TIRES

Chicago (cut)	12.50-13.00
St. Louis, No. 1	9.75-10.25

LOW. PHOS. PUNCHINGS

Buffalo	13.75-14.25
Chicago	12.50-13.00
Eastern Pa.	14.50-15.00
Pittsburgh	15.25-15.75

Nonferrous Metal Prices of the Week

Spot unless otherwise specified. Cents per pound

	Copper: Electro., del. Conn.	Copper: Lake, del. Midwest	Copper: Casting, refinery	Straits Tin: New York Spot	Straits Tin: New York Futures	Lead: N. Y.	Lead: East St. L.	Zinc: St. L.	Aluminum 98-99%	Antimony Spot, N. Y.	Ingot Nickel
April 21	8.50	8.62½	8.25	56.00	56.05	4.25	4.10	4.35	*22.90	7.95	36.00
April 23	8.50	8.62½	8.25	55.90	55.85	4.25	4.10	4.37½	*22.90	7.95	36.00
April 24	8.50	8.62½	8.25	55.80	55.75	4.25	4.10	4.40	*22.90	7.95	36.00
April 25	8.50	8.62½	8.25	55.45	55.45	4.25	4.10	4.40	*22.90	7.95	36.00
April 26	8.50	8.62½	8.25	55.35	55.37½	4.25	4.10	4.40	*22.90	7.95	36.00
April 27	8.50	8.62½	8.25	54.90	54.92½	4.25	4.10	4.40	*22.90	7.95	36.00

*Nominal range 19.00c to 22.90c.

Warehouse Iron and Steel Prices

Cents per pound for delivery within metropolitan districts of cities specified

STEEL BARS	□
Baltimore*	2.75c
Boston††	3.05c
Buffalo	2.95c
Chattanooga	3.26c
Chicago	3.05c
Cincinnati	3.25c
Cleveland	3.05c
Detroit	3.13½c
Houston	3.00c
Los Angeles	3.70c
New Orleans	3.00c
New York‡(d)	3.17c
Pittsburgh(h)	3.00c
Philadelphia*	2.75c
San Francisco	3.60c
Seattle	3.40c
St. Louis	3.14c
St. Paul	3.00c
Tulsa	3.25c

IRON BARS	□
Portland	3.40c
Baltimore*	2.60c
Chattanooga	3.26c
Chicago	2.75c
Cincinnati	3.25c
Detroit	2.98½c
New York‡(d)	3.10c
Phfladelphia*	2.75c
St. Louis	3.14c
Tulsa	3.25c

REINFORC. BARS	□
Boston	2.90c-3.40c
Buffalo	1.95c
Chattanooga	3.26c
Chicago	1.95c-2.10c
Cleveland (c)	1.97½c
Cincinnati	3.10c
Houston	3.25c
Los Ang., cl.	2.15c
New Orleans	3.00c
New York	3.17c
Philadelphia	2.62½c
Pitts., plain(h)	3.15c
Pitts., twisted squares (h)	3.27½c
San Francisco	2.45c
Seattle	2.65c
St. Louis	3.29c
Tulsa	3.25c
Young.	2.30c-2.60c

SHAPES	□
Baltimore*	2.75c
Boston††	3.22c
Buffalo	3.20c
Chattanooga	3.46c
Chicago	3.25c
Cincinnati	3.45c
Cleveland	3.36c
Detroit	3.45c
Houston	3.00c
Los Angeles	3.70c
New Orleans	3.50c
New York(d)	3.27c
Philadelphia*	2.75c
Pittsburgh(h)	3.20e
Portland	3.55c
San Francisco	3.55c
Seattle	3.55c
St. Louis	3.34c
St. Paul	3.25c
Tulsa	3.50c

PLATES	□
Baltimore*	2.75c
Boston††	3.23c
Buffalo	3.20c
Chattanooga	3.46c
Chicago	3.25c
Cincinnati	3.45c
Cleveland, ¼-in. and over	3.36c
Detroit	3.30c
Detroit, ⅜-in.	3.45c
Houston	3.00c
Los Angeles	3.70c
New Orleans	3.50c
New York(d)	3.30c
Philadelphia*	2.75c
Phila. floor	4.35c
Pittsburgh(h)	3.20c
Portland	3.55c
San Francisco	3.55c
Seattle	3.55c
St. Louis	3.34c
St. Paul	3.25c
Tulsa	3.50c

NO. 10 BLUE	□
Baltimore*	2.95c
Boston††	3.40c
Buffalo	3.10c
Chattanooga	3.26c
Chicago	3.20c
Cincinnati	3.35c
Cleveland	3.26c
Det., 8-10 ga.	3.28½
Houston	3.35c
Los Angeles	3.80c
New Orleans	3.50c
New York	3.17c
Portland	3.75c
Philadelphia*	2.95c
Pittsburgh(h)	3.10c
San Francisco	3.75c
Seattle	3.75c
St. Louis	3.19c-3.36c
St. Paul	3.45c
Tulsa	3.70c

NO. 24 BLACK	□
Baltimore*†	3.50c
Boston (g)	4.15c
Buffalo	3.25c
Chattanooga	4.01c
Chicago	3.70c
Cincinnati	3.85c
Cleveland	3.76c
Detroit	4.185c
Los Angeles	4.35c
New York	3.65c
Philadelphia*†	3.80c
Pittsburgh**	3.80c
Portland	4.40c
San Francisco	4.40c
Seattle	4.40c
St. Louis	3.94c
St. Paul	3.695c
Tulsa	4.75c

NO. 24 GAL. SHEET‡	□
Baltimore*†	3.75c
Buffalo	4.00c
Boston (g)	4.75c
Chattanooga	4.61c
Chicago	4.20c-4.30c
Cincinnati	4.45c
Cleveland	4.36c
Detroit	4.85c
Houston	4.40c
Los Angeles	5.05c
New Orleans	4.35c
New York	4.25c
Pitts.** (h)	4.30-4.60c
Portland	5.00c
San Francisco	5.00c
Seattle	5.00c
St. Louis	4.54c
St. Paul	4.19c
Tulsa	5.10c
Philadelphia*†	4.40c

BANDS	□
Baltimore	3.05c
Boston††	3.40c
Buffalo	3.30c
Chattanooga	3.51c
Chicago	3.45c
Cincinnati	3.60c
Cleveland	3.51c
Detroit, ⅜-in. and lighter	3.53½c
Houston	3.25c
Los Angeles	3.90c
New Orleans	3.20c
New York(d)	3.42c
Philadelphia	3.05c
Pittsburgh(h)	3.85c
Portland	3.90c
San Francisco	4.05c
Seattle	3.90c
St. Paul	3.20c
Tulsa	3.45c
St. Louis	3.44c

HOOPS	□
Baltimore	2.80c
Boston	4.40c
Buffalo	3.55c
Chicago	3.45c
Cincinnati	3.60c
Det., No. 14 and lighter	3.53½c
New York	3.42c
Philadelphia	3.30c
Pittsburgh(h)	3.85c
Seattle	5.40c
St. Paul	3.75c

COLD FIN. STEEL	□
Baltimore (c)	3.71c
Boston	4.00c-4.50c
Buffalo (h)	3.55c
Chattanooga*	4.06c
Chicago (h)	3.50c
Cincinnati	3.70c
Cleveland (h)	3.50c
Detroit	3.63½c
Los Ang.(f)(d)	5.95c
New Orleans	4.25c
New York	3.92c-4.42c
Philadelphia	3.73c
Pittsburgh(h)	3.45c
Portland (f)	4.75c
San Fran.(f)(d)	5.95c
Seattle (f)(d)	4.75c
St. Paul	3.20c
St. Louis	3.74c
Tulsa	4.65c

COLD ROLL. STRIP	□
Boston, 0.100-in., 500 lb. lots	5.35c
Buffalo	5.25c
Chicago (b)	5.65c
Cincinnati	5.80c
Cleveland (b)	5.55c
Detroit	5.40c
Philadelphia	4.00c
New York	4.55c
St. Louis	5.74c

(b) Net base, straightening, cutting, boxing, 1 ton or more.
(c) Plus mill, size and quantity extras.
(d) Minus quant. diff.
(e) New mill classif.
(f) Rounds only.
(g) 50 bundles or over.
(h) Outside delivery, 10c less.

‡Domestic bars.
*Plus quan. extras.
**Under 25 bundles.
*†50 or more bundles.
†New extras apply.
††Base 40,000 lbs. extras on less.

Prices at Detroit, Cleveland, Chicago, Pittsburgh, Cincinnati, Chattanooga, New York, Boston, St. Louis on heavier lines are subject to new quantity differentials:

399 pounds and less, up 50 cents; 400 to 9999 pounds, base; 10,000 to 19,999 pounds, 15 cents under; 20,000 to 39,999 pounds, 25 cents under; 40,000 pounds and over, 35 cents under base.

Current Iron and Steel Prices of Europe

Dollars at Rates of Exchange, April 26

Export Prices f. o. b. Ship at Port of Dispatch—By Cable (or Radio)

	British gross tons U. K. ports £ s d		Continental Channel or North Sea ports, metric tons Gold parity, $4.8665 £ s d	
PIG IRON				
Foundry, 2.50-3.00 Silicon.	$15.42	3 0 0	$8.03	1 13 0
Basic bessemer	13.88	2 14 0*	7.30	1 10 0
Hematite, Phos. .03-.05	16.06	3 2 6	....	.....
SEMIFINISHED STEEL				
Billets	$28.27	5 10 0	$11.44	2 7 0
Wire rods, No. 5 gage	40.09	7 16 0	21.90	4 10 0
FINISHED STEEL				
Standard rails	$39.84	7 15 0	$26.77	5 10 0
Merchant bars	1.72c	7 10 0	.69c to .72c	3 2 6 to 3 5 0
Structural shapes	1.69c	7 7 6	.63c to .66c	2 17 6 to 3 0 0
Plates, †¼ in. or 5 mm.	1.83c	8 0 0	.91c	4 2 6
Sheets, black, 24 gage or 0.5 mm.	2.12c	9 5 0	1.24c to 1.27c	5 12 6 to 5 15 0
Sheets, gal., 24 gage, corr.	2.58c	11 5 0	1.51c	6 17 6
Bands and strips	1.89c	8 5 0	.88c	4 0 0
Plain wire, base	2.23c	9 15 0	1.18c	5 7 6
Galvanized wire, base	2.63c	11 10 0	1.38c to 1.40c	6 5 6 to 6 7 6
Wire nails, base	2.75c	12 0 0	1.27c	5 15 0
Tin plate, box 108 lbs.	$ 4.24	0 16 6	.....	.....

British ferromanganese $85 delivered Atlantic seaboard, duty-paid. German ferromanganese £9 0s 0d 4($3.74) f.o.b.

Domestic Prices at Works or Furnace—Last Reported

	£ s d		French Francs		Belgian Francs		Reich Marks
Fdy. pig iron, Si. 2.5	$17.35	3 7 6(a)	$12.64	190	$13.89	295	$24.99	63
Basic bessemer pig iron	16.71	3 5 0(a)*	12.30	185	13.66	290	27.56	69.50†
Furnace coke	4.50	0 17 6	7.98	120	5.18	110	7.63	19.25
Billets	28.27	5 10 0	28.49	430	20.72	440	38.27	96.50
Standard rails	1.89c	8 5 0	2.10c	700	2.31c	1,100	2.38c	132
Merchant bars	1.97c	8 12 0	1.68c	560	1.16c	550	1.98c	110
Structural shapes	2.00c	8 15 0	1.65c	550	1.16c	550	1.94c	107.50
Plates, †¼-in. or 5 mm.	2.03c	8 17 6	2.10c	700	1.47c	700	2.29c	127
Sheets, black	2.35c	10 5 0§	2.55c	850‡	1.63c	775‡	2.59c	144‡
Sheets, galv., corr., 24 ga. or 0.5 mm.	2.92c	12 15 0	4.50c	1,500	3.15c	1,500	6.66c	370
Plain wire	2.23c	9 15 0	3.39c	1,130	2.31c	1,100	3.11c	173
Bands and strips	2.40c	10 10 0	1.95c	650	1.47c	700	2.29c	127

*Basic. †British ship-plates. Continental, bridge plates. §24 ga. ‡1 to 3 mm. basic price. British quotations are for basic open-hearth steel. Continental usually for basic-bessemer steel. (a) del. Middlesbrough. (b) hematite

Bars

Bar Prices, Page 50

Pittsburgh—Last week the bar market showed the second consecutive week of decline in buying. This recession seems to originate chiefly in the automobile and automotive parts industries as there is a fair support from other sources. The price is 1.90c, Pittsburgh, for carbon steel bars and 2.55c for alloy steel bars. Some advance in wrought iron bars is expected but the extent has not been announced.

Chicago—Soft steel bar shipments continue heavy and with large backlogs mills expect to maintain production around current levels for most of this quarter. Soft steel bars now are 1.95c, Chicago, with rail steel 1.85c. Action on the bar iron price still is awaited.

Cleveland—With consumers covered for second quarter, interest in the market now centers in specifications and shipments. Practically no orders have been booked at the new price of 1.95c, base, Cleveland. Mill backlogs are the heaviest in several years, and barring the spread of strikes shipments will continue heavy throughout this quarter. Republic Steel Corp. this week will start its 11-inch bar mill at the Upson plant in Cleveland, down since April, 1932.

New York—Carbon steel bar shipments continue at about the best rate so far this year. There is less railroad tonnage at the moment than a fortnight ago, but general manufacturing requirements are larger. Prices are 2.23c, delivered New York.

Boston — Commercial steel bar specifications are slightly heavier with a somewhat broader demand. Small toolmakers are fairly active. Alloy and forging bars are also in better demand.

Philadelphia — Steel bar production is expanding, with rolling schedules for the remainder of the quarter filling steadily. The market is 2.19c, delivered, Philadelphia. Common iron bars are 1.99c, Philadelphia.

Plates

Plate Prices, Page 50

Pittsburgh—American Bridge Co., Pittsburgh, has been announced as low on 4943 tons of plates in tunnel shaft lining for the Ft. Peck, Mont., dam. The plate market is active from other sources, mainly in railroad buying, but river barge activity in the Pittsburgh district is decidedly slow. Other river barge builders report infrequent small inquiries. Steel plate market is now quoted uniformly 1.85c, Pittsburgh, on spot business. An advance in wrought iron plates is to be made shortly.

Cleveland—April plate specifications exceeded those of March by a substantial margin, and the volume is expected to show still further improvement in the coming month. Individual tonnages, however, are small. Boiler shops are much more active than a year ago. Occasional orders are received for brewery tanks.

Chicago—While inquiries for fabricated plate projects generally are light, demand is holding well. Miscellaneous tank work is pending for various oil companies with a fairly large tonnage involved in gas holders. Plate shipments to railroads and car builders gradually are increasing.

Boston—Plate specifications are steady and in fair volume for miscellaneous requirements. For specified work on which fabricating contracts have been placed the demand has gained. On new business 1.95c applies, but most consumers covered at old prices.

New York—Plates required for cars and locomotives dominate the market here, much of which is for the Delaware, Lackawanna & Western requirements. The navy is expected to issue specifications in May for two of four cruisers for which $27,000,000 has been appropriated, the other two probably to be built in navy yards. With a number of 60-day protections expiring about June 1, platemakers expect heavy production in May.

Philadelphia — General plate specifications are fair with about 5000 tons of plates and 1000 tons of shapes and bars being distributed for 500 Lackawanna freight cars. Seven sellers shared about 4500 tons of plates and sheets for seven coast guard cutters, including Carnegie Steel Co., J. P. Cattie & Bro., Philadelphia, Jones & Laughlin Steel Corp., Alan Wood Steel Co., Superior Steel Corp. and Central Steel Co.

Contracts Placed

500 tons, tanks, Milwaukee, for Barnsdall Oil Co., to Chicago Steel Tank Co., Chicago.

Tonnage unstated, 100 oil storage tanks, to the Standard Steel Works Co., St. Louis.

Contracts Pending

4943 tons, tunnel shaft lining, Fort Peck, Mont., dam, American Bridge Co., Pittsburgh, low; Silas Mason Co., New York, and Walsh Construction Co., Davenport, Iowa, general contractors.

270 tons, steel sheet piling, Coulee dam project, bureau of reclamation, Denver; bids in.

150 tons, 50 steel pontoons, 21 feet 2½ inches long, United States engineer, Memphis, Tenn., United Welding Co., Middletown, O., low; Chicago Bridge & Iron Works, Chicago, low on 25 sections, 18-inch inside diameter steel pipe, each 40 feet long.

Sheets

Sheet Prices, Page 50

Pittsburgh—New sheet buying is encouraging, mainly from rural sources. Sheet mills are advising customers to enter orders now for material which will be needed in June. Prices now quoted are 2.65c, Pittsburgh, for black; 3.25c for galvanized; and 2.00c for No. 10 heavy hot-rolled.

Cleveland—Due to a strike at the Fisher Body Co.'s Cleveland plant last week all steel shipments were suspended, although in the same week steelworks operations in the Cleveland district rose six points to 80 per cent, and sheet mill schedules here and in nearby districts were uninterrupted. Despite strikes, sheetmakers believe the automotive industry will take in all the material contracted for second quarter, because of the price advances they face for the next period. Sales of household utilities are heavy, and manufacturers of refrigerators, stoves and washing machines are releasing considerable material. Sign manufacturers also are active.

Chicago—Sheet specifications and shipments are in fair volume with heavier production necessary if tonnages are to be shipped by the end of this quarter. The movement to automotive plants is lighter, this being partly a reflection of labor troubles at Cleveland and St. Louis. Despite the settlement of the strike at the Seaman Body plant at Milwaukee, production is slow to get under way and sheet shipments are restricted. New business at the higher sheet prices now effective is light.

Boston—Except in the case of some jobbers, sheet consumers are slow to increase specifications, although practically all are covered. For this reason sellers expect heavier shipments during the last few weeks of the current quarter.

New York—While some sheet sellers have indicated that they will allow as late as June 15 for specifications for shipment by the end of the quarter, such cases are exceptional. Some producers are warning custom-

ers that they must have June specifications not later than the latter part of May, and are endeavoring to fix a deadline for May specifications this week.

Armco International Corp. has been awarded 1000 tons of sheets, mainly automobile stock, by the Amtorg Trading Corp., New York, for shipment to Russia.

Philadelphia—Sheet specifications are not coming out as freely as desired and sellers are intensifying their efforts to get releases so far as possible to avert shipping complications later. The Edward G. Budd Mfg. Co. here reports fabricating 18,500 tons of steel, mainly sheets, in the first quarter, compared with 6000 tons in the same period last year.

Buffalo—Demand for sheets continues active, with local mills operating at 90 per cent.

Washington — Wheeling Steel Corp., Wheeling, W. Va., has booked 195 tons of galvanized and black sheets on which bids were opened April 10 under navy schedule 2106.

Cincinnati—A slight hesitancy in specifying of sheets for certain automobile manufacturers is ascribed to unsettled labor conditions. Shipments to other industries are heavy. Sheet mill operations in this district remain about 65 per cent.

St. Louis—Contracting has declined since price advances became effective, but specifications are on a liberal scale, and are coming from all classes of users. Somewhat better demand is in evidence from the railroads.

Railroads

Track Material Prices, Page 51

Buying by railroads has subsided as major requirements seem to have been covered. Rail mills are receiving specifications on various orders. While no inquiry has been issued it is believed the Reading will be in the market soon for a tonnage of 130-pound rail. Nashville, Chattanooga & St. Louis has placed 4000 tons of 90 and 110-pound rails with Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.

Chicago Great Western is reported to have placed 500 box cars with the Pullman Car & Mfg. Corp. and the Boston & Maine ten de luxe coaches with Bradley, Osgood Car Co., Worcester, Mass. The latter is expected to place 21 suburban cars soon.

Seaboard Air Line will open bids during this week on its inquiry for 1000 50-ton box cars and also on steel underframes for 10 automobile cars.

American Car & Foundry Co. has awarded 4200 tons of plates, shapes and bars, 1050 tons of wheels, and 580 tons of axles for 350 hoppers for the Delaware, Lackawanna & Western. Magor Car Corp. will place shortly about 1800 tons of plates shapes and bars, 450 tons of wheels and 240 tons of axles for 150 hoppers for the same road. American Car & Foundry Co. has placed a round tonnage of plates, shapes and bars for 100 box cars and parts for 50 box and 50 gondolas recently booked from the Gulf, Mobile & Northern with Gulf States Steel Co. These cars will be built at the St. Louis plant. The order originally was reported to cover construction of 150 box cars and 50 gondolas. American Locomotive Co. has awarded about 800 tons of plates for 20 locomotives for the Delaware, Lackawanna & Western to an eastern mill.

PWA has completed a loan of $3,623,000 to the Delaware, Lackawanna & Western to finance its purchase of 20 steam locomotives, four oil-electric locomotives and 500 freight cars, made some time ago. A second loan of $1,043,000 is in preparation to enable this road to repair locomotives and cars in its own shops. Great Northern has been loaned $850,000 to pay for steel underframes and repairs for 650 refrigerator cars in its own shops.

Effective with April 21, billet quality light rails are quoted $35, Pittsburgh, on all noncontract business which was not covered at the $32 base, prior to that date. Rerolling quality light rails now are quoted $1 under the market for billet quality, or $34, Pittsburgh. Owing to the fact that the scrap market has shown no further advances, and that most billet light rail buyers are under $32 contract until July 1, relay rails at Pittsburgh hold unchanged to these levels; 24-45 pound sections, $26; 50-60-pound, $23; 70-75-pound, $18; 80-85-pound, $25; and 100-pound, $26.

Westinghouse Air Brake Co., Pittsburgh, reports highly satisfactory results from a new type of air-brake recently announced, and receipt of an order last week for 750 sets to be used in replacing brakes on old freight cars. Pittsburgh & Lake Erie opened bids April 20 on second quarter requirements of tubes and steel axles, though it has not made an award.

Car Orders Placed

Chicago Great Western, 500 box cars, to Pullman Car & Mfg. Corp., Chicago.

Boston & Maine, 10 de luxe coaches, to Bradley, Osgood Car Co., Worcester, Mass.

Rail Orders Placed

Nashville, Chattanooga & St. Louis, 4000 tons 90 and 110-pound rails, to Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.

Iron Ore

Iron Ore Prices, Page 52

Cleveland—Lake Superior iron ore prices for the season have not been established, but there are indications that there will be some announcement of action on the Ford Motor Co.'s inquiry for 50,000 tons—on which last year's prices were quoted—this week. There is an unverified rumor to the effect the tonnage has been obtained by exchange with a steelworks interest.

This week, also, vessels will begin moving northward, though some of the leading shippers do not expect to bring down ore until about May 10. Reports were received here last week that trucks were driving across the ice at Sault Ste. Marie.

The Pittsburgh Steamship Co., subsidiary of the United States Steel Corp., is fitting out 43 steamers of its fleet of 86 steamers and barges. Last year at this time it was fitting out only 15; two months later only 16 were operating, but by August it had 71 in service.

On May 1 there will be approximately 26,500,000 tons of iron ore at lower lake ports and furnaces, six to seven million tons more than on the comparable dates in the predepression period. Consumption now is proceeding at the rate of about 30,000,000 tons per year. Unless there is a considerable increase over the present rate, ore shippers do not expect the total movement for this season to exceed 35,000,000 tons.

Semifinished

Semifinished Prices, Page 51

Tube rounds now are 1.90c base, Pittsburgh. There has been no further changes in the market for semifinished steel, with skelp holding at 1.70c, sheets bars $30; carbon billets $29; wire rods $38. Alloy billets, slabs and ingots are quoted $51 uniformly at all basing points. Nonintegrated strip, sheet and tin plate mills continue to take heavy shipments of billets and sheets bars, and there has been considerable improvement in skelp commitments.

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Shapes

Structural Shape Prices, Page 50

Cleveland — Competition among fabricators still is keen, their code not yet being in effect, and fabricators in many instances passing along to buyers the price advantage they have by reason of contracts for material at the former levels. This situation, however, is expected to right itself further on in this quarter. The market in this district is quiet. The government rejected bids on aviation field buildings at Middletown, Pa., requiring more than 3000 tons of shapes, and new proposals will be taken May 5.

New York—Many small projects pending for some time have been closed by contractors in time to take advantage of former low prices. A fair volume of work has been accumulated. The date for opening bids for a lift railroad bridge over the Cape Cod canal at Boston has been changed by federal engineers from May 9 to May 17.

Pittsburgh—American Bridge Co., Pittsburgh, bid low last week to Silas Mason Co., New York, and Walsh Construction Co., Davenport, Iowa, on a subcontract for 2946 tons in tunnel shaft work for the Fort Peck, Mont., dam. Pennsylvania state lettings continue frequent. Plain material is 1.85c, Pittsburgh.

Chicago—Shape awards, amounting to only several thousand tons, are overshadowed by inquiries for bridges requiring more than 50,000 tons. These projects are sponsored by PWA activities principally. Bids have been rejected on the Milwaukee filtration plant involving 2500 tons of shapes and piling, and new specifications will be drawn to accommodate the work to the amount of money available.

Buffalo—Buffalo district fabricators have figured on more than 3000 tons of small-lot structural steel projects during the past week or two, and look for general covering in the near future.

Philadelphia—Fabricators expect specifications this week for the third section of the high-speed line bridge over the Delaware river here requiring 1400 tons of shapes, 1000 tons of piling, and 700 tons of concrete bars. Seven fabricators shared in the distribution of 2460 tons of shapes for seven coast guard cutters, for which 4500 tons of plates and sheets also were awarded.

Boston—Bids went in this week on 565-ton bridge over the Kennebec river, Maine. Structural steel continues active with close to 6000 tons of new bridge work being figured.

Shape Contracts Placed

2460 tons, for seven coast guard cutters, navy department, Washington; distributed to Bethlehem Steel Co., Bethlehem, Pa.; John T. Hill, Joseph T. Ryerson & Sons Inc., Enterprise Galvanizing Co., Baltimore; Jones & Laughlin Steel Corp., Carnegie Steel Co., Pittsburgh.

1400 tons, bridge, Spring Valley, Ill., to McClintic-Marshall Corp., Bethlehem, Pa.

1230 tons, Tom Bigbee river bridge, Naheola, Ala., to Virginia Bridge & Iron Co., Roanoke, Va.

675 tons, Wilson high school, Washington, to Barber & Ross Inc., Washington; through McCloskey & Son, Philadelphia.

510 tons, coal handling bridge, Detroit, to R. C. Mahon Co., Detroit.

470 tons, bridge, Lead, S. D., to Worden-Allen Co., Milwaukee.

450 tons, dormitories at University of West Virginia, Morgantown, to Pittsburgh Bridge & Iron Works, Rochester, Pa.

390 tons, buildings, Mattewan hospital, Beacon, N. Y., to Bethlehem Fabricators Inc., Bethlehem, Pa.

360 tons, postoffice, Holyoke, Mass., to Lehigh Structural Steel Co., Allentown, Pa., previously reported to another fabricator.

350 tons, bridge, Cimmaron river, Kingfisher county, Oklahoma, to Missouri Valley Bridge & Iron Co., Leavenworth, Kans.; L. M. Mackey, Britton, Okla., general contractor.

265 tons, state tuberculosis hospital, Trenton, N. J, to N. A. K. Bugbee, Trenton, N. J.

250 tons, state bridge, Bayou des Allemands, Old Spanish trail, St. Charles-Lafurche parishes, Louisiana, to Vincennes Bridge Co., Vincennes, Ind.

230 tons, bridge, NRH 634-B, Tarrant county, Texas, to Central Texas Iron Works, Waco, Tex.

199 tons, one plate girder bridge and one I-beam overhead bridge, West Elizabeth borough, Allegheny county, Pennsylvania, to Fort Pitt Bridge Works, Pittsburgh; through Mike Manella Construction Co., Pittsburgh

190 tons, bridge, Nolan county, Texas, to North Texas Iron & Steel Co., Fort Worth, Texas.

190 tons, building at State college, Amherst, Mass., to Lehigh Structural Steel Co., Allentown, Pa.; through George Reed Co.

185 tons, bridge, NRH 634-A, part 1, Tarrant county, Texas, to Central Texas Iron Works, Waco, Tex.

180 tons, addition to armory and sheds, Natick, Mass., to unstated fabricator.

155 tons, shapes and bars, San Antonio river bridge, highway 119, near Goliad, Tex., and bridges, highway 2, Medinia county, Texas; 80 tons of shapes to Petroleum Iron Works, Houston, and 75 tons of bars to Alamo Iron Works, San Antonio; H. B. Zachary Co., Laredo, Tex., general contractor.

150 tons, lateral bridge supports for Pennsylvania railroad work in Washington, to Belmont Iron Works, Philadelphia.

150 tons, bridge, Orchard Place, Ill., to McClintic-Marshall Corp., Bethlehem, Pa.

150 tons, state bridges in four counties in Colorado, to unnamed interests.

147 tons, state highway bridge, Cow Pasture river, Alleghany county, Virginia, to American Bridge Co., Pittsburgh; R. W. Moore & Co., Staunton, Va., general contractor.

140 tons, state highway bridge, Rutherford county, Tennessee, to Nashville Bridge Co., Nashville, Tenn.

135 tons, company officers' quarters, Fairfield, O., to Jones & Laughlin Steel Corp., Pittsburgh.

130 tons, Italian village, World's fair, Chicago, to Mississippi Valley Structural Steel Co., Decatur, Ill.

130 tons, highway bridge, Great Neck, Long Island, N. Y., for Long Island railroad, to American Bridge Co., Pittsburgh.

125 tons, bridge for Long Island railroad at Great Neck, N. Y., to American Bridge Co., Pittsburgh.

120 tons, bridge, Bowie county, Texas, to Virginia Bridge & Iron Co., Roanoke, Va.

115 tons, bridge, Ellis county, Texas, to North Texas Iron & Steel Co., Fort Worth, Tex.

110 tons, lagoon pavilion, Armour & Co., World's fair, Chicago, to Vierling Steel Works, Chicago.

100 tons, miscellaneous railroad work, Chicago, to Vierling Steel Works, Chicago.

100 tons, bridge, Harris county, Texas, to Virginia Bridge & Iron Co., Roanoke, Va.

105 tons, bridge, Washington county, Mississippi, to Jones & Laughlin Steel Corp., Pittsburgh.

100 tons, housing project, Philadelphia, to Bethlehem Fabricators Inc., Bethlehem, Pa.; through Turner Construction Co.

100 tons, shapes and welded trusses, state warehouse, Indiana, Pa., to Guibert Steel Co., Pittsburgh.

Shape Awards Compared

	Tons
Week ended April 28	**11,886**
Week ended April 21	**14,600**
Week ended April 14	**16,827**
This week in 1933	**7,405**
Weekly average for 1933	**15,413**
Weekly average, 1934	**16,235**
Weekly average, March	**18,349**
Total to date 1933	**180,559**
Total to date 1934	**292,228**

Shape Contracts Pending

6000 tons, bridge, Bagnell, Mo.

5000 tons, bridge, Buzzard Bay, Mass.

4000 tons, bridge, Atchison, Kans.

4000 tons, toll bridge, Moline, Ill.

4000 tons, bridge, Hannibal, Mo.

3800 tons, bridge, Washington, Mo.

2946 tons, comprised of 1650 tons main tunnel shaft supports, 696 tons reinforcing intake structure and rack guides, and 600 tons steel shaft supports, Fort Peck, Mont., dam; American Bridge Co., Pittsburgh, low in bids to Silas Mason Co., New York, and Walsh Construction Co., Davenport, Iowa, general contractors.

2500 tons, including 1700 tons of piling, filtration plant, Milwaukee; new bids to be asked.

2500 tons, bridge, Meredosia, Okla.

2000 tons, oil derricks, Beaumont, Tex.

2000 tons, bridge, Versailles, Mo.

1500 tons, bridge, Konawa, Okla.

1350 tons, bridge, Columbia, La.
1300 tons, bridge, Eufaula, Okla.
1300 tons, bridge, Sallisaw, Okla.
1200 tons, bridge, Wiota, Mont.
1200 tons, bridge, Kansas City, Mo
1100 tons, Humble building, Houston, Tex.
1000 tons, bridge, Claremore, Okla.
1000 tons, bridge, Purcell, Okla.
800 tons, bridge, Camargo, Okla.
800 tons, bridge, Wayland, Mo.
800 tons, bridge, Winnsboro, La.
800 tons, bridge, Shawnee, Okla.
800 tons, bridge, Oklahoma City, Okla.
675 tons, bridge and building, Dallas, Tex.
675 tons, five bridges for Southern Pacific railroad, four in California and one in Oregon.
614 tons, state railroad crossing, Pocatello, Idaho; North West Roads Co., Portland, Oreg., general contractor.
600 tons, bridge, Poplar Bluff, Mo.
600 tons, bridge, Eldorado, Ark.
565 tons, bridge, Kennebec river, Fairfield-Benton, Maine; bids April 25.
560 tons, piling, filtration plant and packet freight terminal, Hammond, Ind.; Mackie-Thompson-Tamm Inc., Chicago, low on general contract.
550 tons, bridge, Missouri Pacific railroad, Fisk, Mo.
550 tons, bridge, Fairfield, Maine.
400 tons, bridge, Van Buren, Ark.
400 tons, bridge, Richmond, Mo.
378 tons, 196-foot through truss bridge superstructure, and rebuilding work, for state, between Clarion and Armstrong counties, Pennsylvania; Lackawanna Steel Construction Corp., Buffalo, low at $38,981.35 for fabrication and erection complete; bids April 20.
360 tons, office and store, for C. Q. Payne, Stamford, Conn.
300 tons, laboratory building, Troy, N. Y., for Rensselaer Polytechnic institute.
280 tons, state highway bridge, Kaufman county, Texas; bids in April 30.
280 tons, highway and bridges, Crawford county, Arkansas; bids in April 25. Also 65 tons of reinforcing steel.
200 tons, university library addition, Seattle; Peter P. Gjarde, Seattle, low.
125 tons, postoffice, White River Junction, Vt.; Swanburg Construction Co., Manchester, N. H., low.

Strip Steel

Strip Prices, Page 51

Pittsburgh — Strip steel buyers were being informed last week of the advisability of entering specifications, ordinarily intended for June, to be rolled in May, thus avoiding the possibility of carry-overs into July. The market at Pittsburgh holds at 2.00c for hot-rolled strip and 2.80c for cold-rolled.

Cleveland—Strip mill schedules are rising, with further gains in specifications, producers now having good backlogs for May. A strike at the Fisher Body Co.'s plant here interrupted shipments last week, but the movement to other automobile manufacturing interests is steady.

Chicago—With heavy order books, strip producers anticipate continued active operations this quarter. Deliveries recently have been well maintained and specifications indicate a well sustained rate of consumption in the automotive and other important consuming industries. Hot-rolled strip now is 2.10c, Chicago, with cold-rolled strip 2.80c, Pittsburgh-Cleveland.

New York—While strip tonnage continues to move well, there are evidences of a lag in actual consumption, but which may be only temporary. Hot strip is 2.33c, New York, and cold strip, 3.13c.

Boston—Most cold-rolled strip mills are active and in some instances rerollers are pushing hot mills for shipments. The latter are well booked.

Philadelphia — Releases of strip tonnage are disappointing to sellers, who fear difficulties later in making shipments. Hot-rolled strip is quoted at 2.29c, Philadelphia, and cold-rolled 3.09c, Philadelphia.

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Reinforcing

Reinforcing Bar Prices, Page 51

Pittsburgh—Bids are expected late in May or June on what is estimated will be 11,000 tons of new billet steel reinforcing bars for the Grand Coulee dam in Washington. Another important western job is work for Boulder dam, where a second 6000-ton letting went in April 26. A large portion of the total of 36,000 tons of bars which this job requires have yet to be bought. Last week an advance in rail steel reinforcing bars of $3 a ton was announced, this increase being similar to that in new billet steel reinforcing bars.

Chicago—While new orders and inquiries are light, reinforcing bar shipments gradually are increasing. New bids will be asked on the Milwaukee filtration plant involving 6200 tons of bars. Low bidders on the general contract for two sections of the Chicago sanitary district program requiring 1200 tons have been announced. An advance of $3 a ton in the price of rail steel reinforcing bars is expected here shortly.

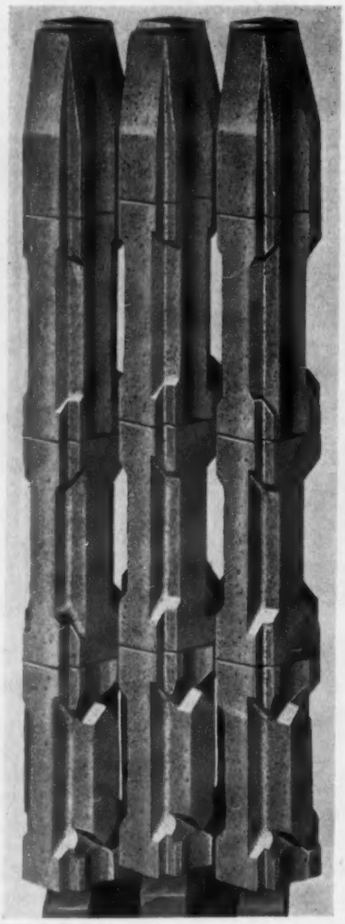
New York—Higher prices on billet reinforcing bars now are in effect. A fair volume of business is pending.

Philadelphia — Announcement of an advance of $3 a ton on new billet steel reinforcing bars brought in requests for protections on identified projects, but such projects were not numerous. The largest pending tonnage is 700 tons for the third section on the high-speed line bridge over the Delaware river here. Cut lengths of billet bars on the new basis are 2.34c, Philadelphia.

Boston—Pending reinforcing steel demand is the heaviest in months, largely for highways and bridges in Massachusetts. The $3 a ton advance on billet bars now is in effect.

Cleveland—Some small lots of concrete bars were placed here last week prior to the $3 a ton advance. The state completed the 1000-ton North Olmstead, O., culvert project by distributing 430 tons to two interests here.

The American Open Joint Checker



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May we have the pleasure of showing you this design and explain its superiority when you are considering rebuilding your Blast Furnace Stoves.

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Engineers

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Reinforcing Steel Awards

3227 tons, tunnels, Fort Peck, Mont., dam, to Sheffield Steel Corp., Kansas City, Mo.; through Silas Mason Co., New York, and Walsh Construction Co., Davenport, Iowa.

1100 tons, first section of Camden, N. J., approach to the Delaware river bridge speed line, to Concrete Steel Co., Philadelphia; this was erroneously reported last week as going to another seller.

575 tons, Park street bridge, Oakland, Calif., to W. S. Wetenhall Co., San Francisco.

430 tons, state culvert, North Olmstead, O.; 272 tons to Truscon Steel Co., Youngstown, O.; 148 tons to Patterson-Leitch Co., Cleveland.

400 tons, sewer, Cincinnati, to Joseph T. Ryerson & Sons Inc., Cincinnati, through Torson Construction Co., general contractors.

223 tons, Santa Fe viaduct, Nolan county, Texas, to North Texas Iron

Concrete Awards Compared

	Tons
Week ended April 28	5,589
Week ended April 21	5,820
Week ended April 14	3,856
This week in 1933	3,974
Weekly average for 1933	3,771
Weekly average 1934	4,811
Weekly average March	6,313
Total to date 1933	57,383
Total to date 1934	86,601

& Steel Co., Fort Worth, Tex.; W. R. West, Fort Worth, general contractor.

300 tons, tank foundations, Tidewater Oil Co., Revere, Mass., to Kalman Steel Corp., Bethlehem, Pa.

125 tons, bridge, Cimmaron river, Kingfisher county, Oklahoma, to Capitol Steel & Iron Works, Oklahoma City; L. M. Mackey, Britton, Okla., general contractor.

115 tons, bridge and highway, Elizabeth, N. J.; 50 tons of bars to Kalman Steel Corp., Bethlehem, Pa.; 65 tons of mesh to Igoe Bros., Newark, N. J.; through J. F. Chapman & Son.

109 tons, bars and bar joists, building, Teachers' college, Fredericksburg, Va., to Truscon Steel Co., Youngstown, O.; J. F. Barbour & Sons, Roanoke, Va., general contractors. Roanoke Iron Works awarded 15 tons of shapes.

100 tons, highway structure, Chemun county, New York, to Kalman Steel Corp.; through Wheeling Engineering Co. Inc.

100 tons, Pioneers' Home, Sitka, Alaska, to Pacific Coast Steel Corp., Seattle; Warrack Construction Co., Seattle, general contractor.

Reinforcing Steel Pending

11,000 tons, Grand Coulee dam, Washington; bids expected in late May or June.

6200 tons, filtration plant, Milwaukee; new bids to be asked.

6000 tons, Boulder dam, Boulder, Nev.; bids in April 26.

1200 tons, Chicago sanitary district; S. A. Healy low on general contract.

520 tons, bars and reinforcing fabric, highway projects, Caddo and Beauregard counties, Louisiana; bids May 8.

450 tons, sewer, Westchester county, New York; bids being taken.

404 tons, 3897-foot six-span reinforced concrete arch bridge, Mt. Union borough, Huntington and Mifflin counties, Pennsylvania; bids May 11.

320 tons, renovating bridge, Jackson valley drainage project, Springfield, Mo.; bids May 1.

250 tons, sewage disposal plant, Perth Amboy, N. J.

235 tons, state railroad crossing, Pocatello, Idaho; North West Roads Co., Portland, Oreg., general contractor.

205 tons, state highway projects, Texas; bids in April 30.

185 tons, immigrant station, Staten Island, N. Y.; Shaw Construction Co., low.

175 tons, 14-story annex, Humble Oil & Refining Co., Houston, Tex.; American Construction Co., Houston, general contractor.

100 tons, university library addition, Seattle; Peter P. Gjarde, Seattle, low.

Wire

Wire Prices, Page 51

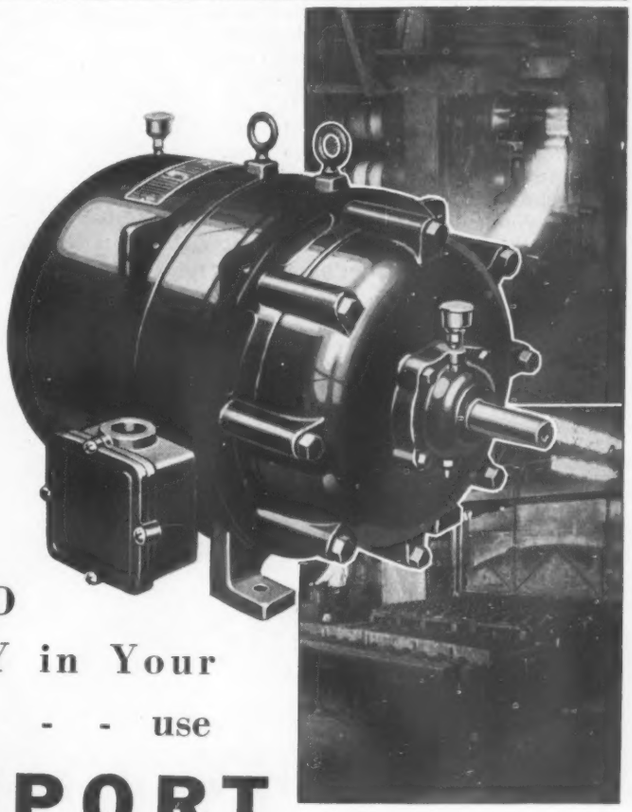
Cleveland—Mill backlogs are increasing, with heavier specifications for wire and wire products. All consumers apparently are endeavoring to lay in stocks this quarter, and though the amounts are small in many instances, collectively the volume is imposing. Some producers believe production will reach its peak early in June.

Pittsburgh — New quotations on some wire products do not become operative until the latter part of this week, this applying to staples, galvanized barbed wire, annealed and galvanized fence wire. However, on nails, rods, and manufacturing wire, higher prices have been nominally quoted during the past week.

Chicago — Wire shipments are increasing and mill operations have been increased during the past week or two. Large bookings at prices effective before recent advances assure a continuation of heavy schedules through this quarter. Prices now effective are $2.60, Chicago, for wire nails and 2.35c for plain wire.

New York—Substantial quantities of wire nails and fencing are being purchased for Cuba, augmenting good export buying in recent weeks for South America and the Orient. Domestic shipments are receiving seasonal stimulation.

Boston—Wire operations continue to increase, although the improve-



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ment has spread slowly for electrical wires. Manufacturers' wire and specialties are active.

Pipe

Pipe Prices, Page 51

Pittsburgh—Revised method of quoting prices on lap weld and seamless boiler tubes, probably will be announced early in May. Instead of present method of quoting discounts off list, it is expected boiler tubes will be quoted on a flat-price basis per 100 feet, with allowances for size and quantities. On April 27 the advanced prices on standard butt and lap weld, as well as steel line pipe, became effective with revised discounts now 3½ points less, equivalent to an advance of $7 a ton in the net price, when figured on an unchanged $200 per net ton base price, Pittsburgh and Lorain, O. A counter-filing last week was made in ⅛-inch standard and line pipe, with the net result that no advance was made in this size from the former price as of July 1, 1933. There will be no change in the price of wrought iron pipe for the balance of the second quarter.

Chicago—Cast pipe demand continues disappointing and recent delays in the placing of contracts have resulted in a warning from Washington that unless prompt action is taken, loans already granted to the various municipalities will be cancelled and transferred to other centers still seeking funds. A large tonnage is in prospect for Chicago sanitary district work, with bids scheduled to be asked over coming months.

Boston—Cast pipe buying has slumped, but inquiry, mostly for smaller lots, is fair. Several tonnages are up for Rhode Island. The New England pipe foundry has a substantial backlog.

New York—Increases in pipe prices have become generally effective. Conduit and other manufacturing consumers of pipe are covered in advance, and some protections are out on identified construction jobs, but much of the tonnage that is now moving is at the new levels. No specifications are active here on any sizable line pipe work.

New York—Miami, Fla., has placed the largest order of cast pipe in the East in some time—nearly 8000 tons with a Birmingham, Ala., foundry. Prospective cast pipe volume is heavier, with an increase in contracts placed.

Cast Pipe Placed

7925 tons, 24, 30 and 36-inch watermains, with fittings, Miami, Fla., to United States Pipe & Foundry Co., Burlington, N. J.

1100 tons, with fittings, Pelham, N. Y., to United States Pipe & Foundry Co., Burlington, N. J.

750 tons, 16-inch and under, Gretna, La., tentatively awarded to Dixie Mill Supply Co., New Orleans.

500 tons, 12-inch, with fittings, Pulaski, N. Y., to R. D. Wood & Co., Philadelphia.

435 tons, 16-inch, centrifugal, Juneau street extension, Seattle, to United States Pipe & Foundry Co., Burlington, N. J.

430 tons, state hospital, Helmuth, N. Y., to United States Pipe & Foundry Co., Burlington, N. J.

200 tons, various sizes, Chicago sanitary district, to James B. Clow & Sons, Chicago.

Cast Pipe Pending

2157 tons, 4 to 12-inch, classes 150 and 250, East Bay municipal utility district, Oakland, Calif.; bids May 2.

765 tons, 6-inch, class 150, San Francisco; bids in.

483 tons, 24-inch, Chicago; bids May 3.

185 tons, 4 and 6-inch, also fittings, Willow Spring, Mo.; bids in.

140 tons, Monterey, Calif.; new bids in.

125 tons, 6-inch, Southern Pines, N. C.; also alternates on 150,000-gallon or 200,000-gallon tank; bids in.

Unstated tonnage, 6600 feet, also steel pipe, $60,000 water extension, Dallas, Tex.; bids about May 16, John M. Didinger, engineer.

Unstated tonnage, three miles, 6-inch, Drain, Oreg.; bids May 8.

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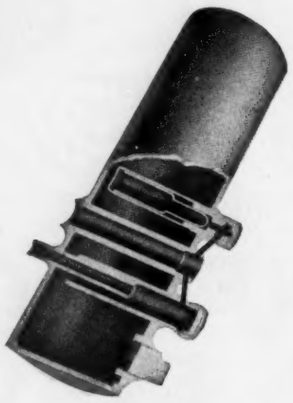

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Pig Iron

Pig Iron Prices, Page 52

Pittsburgh — Allegheny Steel Co., Brackenridge, Pa., recently contracted for its second quarter requirements to the extent of about 12,000 tons, and it is understood the order was divided four ways. Both basic and bessemer grades were purchased. Last week some initial deliveries were made on the order, one supplier having shipped a bargeload of about 500 tons to the Allegheny landing at Brackenridge. Merchant iron shipments continue at a high level and lend indication of continuing strong through May and June. Both the Davison Coke & Iron Co.'s Neville Island stack and the Shenango Furnace Co.'s Sharpsville, Pa., furnace continues in blast.

Cleveland—First sales at the new prices of $18.50, base, lake furnace,

for No. 2 foundry and malleable, have been made by furnace interests here, these comprising a few carload lots for special purposes the buyers could not foresee. Generally, melters have contracted for the bulk of their second quarter needs, and the business has settled down to the routine of getting in specifications and making the shipments. The movement, still about 30 per cent ahead of March for the comparable number of days, reflects a fair degree of activity at foundries. Strikes at automobile plants have not slowed up shipments from furnaces here. The Interlake Iron Corp. has lighted its B stack at Toledo, O., now operating both units there.

Chicago—While new business is light following extensive coverage prior to recent price advances, shipments against old contracts are well maintained and are heavier than a month ago. The April movement will be the heaviest so far this year with larger deliveries expected for May and June. Prices now are $18.50, furnace, for No. 2 foundry and malleable. Quotations on silvery iron are being advanced 50 cents a ton on grades up to and including 11 per cent. Lake Superior charcoal pig iron has been advanced 50 cents a ton to $21, base, furnace, the delivered Chicago price now being $24.04.

Boston — Most consumers have covered on requirements which will take them well into the third quarter. Foundry melt has shown a spotty improvement, but shipping orders have been slow to gain.

New York—With practically all consumers under contract, activity has settled down principally to routine releases, with shipments expanding moderately. With few, if any, exceptions recent advances of $1 a ton will become effective generally in the East early this week. The Troy, N. Y., furnace is scheduled to go into blast with a backlog estimated in excess of 80,000 tons, contracts for a substantial portion of which undoubtedly will have to come up for renewal at the end of this quarter.

Philadelphia — Specifications are lagging with pig iron prices generally at the new higher levels.

Buffalo — A lull in pig iron has followed recent heavy purchases. Shipments are good and principal producers here are anxious to get barges to ship iron to eastern seaboard.

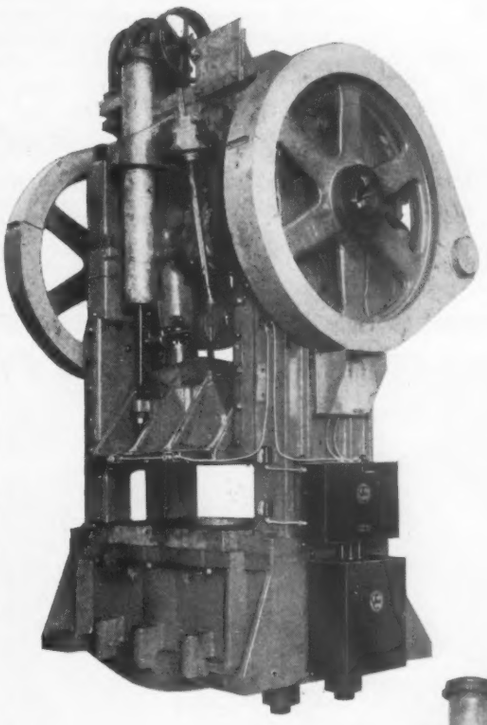
Cincinnati—New bookings during the past week were confined to spot orders. Important consumers appear well covered. In many cases the rate of shipment points to a heavy movement in June if all iron on contract is to be taken out. Effective May 5, Jackson county, O., silveries, 6 to 11 per cent silicon, inclusive, will be quoted 50 cents a ton higher. Higher silicon grades will be unchanged.

St. Louis — Deliveries continue in good volume, but little new ordering is noted. Some important consumers have fully covered needs well into the third quarter. Daily melt is at a higher rate than at any time in more than two years. In the recent buying movement, some business was rejected because of lack of the analyses required.

Birmingham, Ala.—Stocks of both basic and foundry iron are being built up to carry over any emergency. Two blast furnaces were banked last week because of a strike of furnace workers. Eight stacks are blowing in this district.

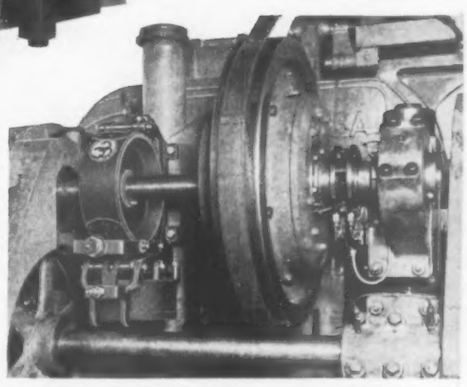
Toronto, Ont.—Demand is improving although forward contracting is

New Power Press Control Insures Safety



Safety to the operator is one of the main features of the automatic electric control operation of power presses developed by Clark Controller through the use of automatic control panel and electric brake. The power unit actually running the press has no connection with this control unit.

The safety feature is the non-repeat control system of operating the press. The installation illustrated is on a Niagara press although the same unit could be applied to any similar press. Patent pending.



Above illustration is complete view of press showing the automatic control panel while view at the right shows the electric brake unit.

THE CLARK CONTROLLER CO.
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Cleveland, Ohio

lacking. Daily melt is reported about 35 per cent of capacity, tending higher. Production has been stepped up with the blowing in of a stack at Sydney, N. S. Prices are unchanged.

Scrap

Scrap Prices, Page 53

Pittsburgh—Continued dullness of steel and iron scrap last week forced a decline in important grades of 50 cents a ton, so that No. 1 heavy melting steel is now quoted $13.50 to $14, machine shop turnings $9.50 to $10 and hydraulic compressed sheets $13.50 to $14. The lower price is based on the willingness of dealers to sell rather than from actual mill buying. Melters contribute to weakness by their desire to maintain low inventories.

Cleveland — Blast furnace grades of scrap have been marked down 25 cents per ton here and No. 1 cast has been advanced 50 cents. Strike conditions have affected sheet mills and lessened scrap consumption.

Chicago — Heavier offerings of scrap contribute to an easier tone. Lack of mill buying of heavy melting steel leaves this grade nominal at $11.50 to $12, although sellers in covering old orders are able to pick up more material at around $11.25 than they were a short time ago. Rejections continue numerous.

Boston—Scrap buying in New England shows little improvement, but buying for outside shipment holds fairly well. Several grades are slightly higher, notably shafting.

New York — Dealers are buying moderately against contracts but the scrap market lacks snap. Domestic consumers are regulating shipments. Prices are unchanged but sentiment is less stable.

Buffalo—The scrap market is nominal, with some larger users restricting shipments. The arrival of boat scrap has materially weakened present markets but dealers refuse to sell tonnage at current offers.

Detroit—No. 1 heavy melting steel, hydraulic compressed sheets, blast furnace scrap, busheling and No. 2 heavy melting steel declined 25 cents a ton last week, owing to large offerings. Loose sheet clippings and heavy breakable cast are off another 50 cents.

Cincinnati—Iron and steel scrap prices are unchanged, but weak and nominal. Business during the past week was made up of small dealings, mills remaining out of the market except for miscellaneous lots.

St. Louis—While operations at steel plants continue to expand, and are at the highest rate in many months, iron and steel scrap is quiet, with the price easier. The chief reasons for the weakness are that many interests are well supplied, offerings are somewhat freer than heretofore and users differ from dealers on prices.

Birmingham, Ala. — Melters of steel and iron scrap are buying lightly, due to labor uncertainties, and supplies are large.

Toronto, Ont.—Minor improvement is taking place in iron and steel scrap. While sales are dull in steel grades there is a fair movement of iron scrap to foundries. Iron grades are in steady demand with several lines scarce. Sales generally are running well ahead of those at the beginning of the year. Prices are firm and unchanged.

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Warehouse

Warehouse Prices, Page 54

Pittsburgh—Advances of 15 to 40 cents per 100 pounds were announced last week by warehouses, generally effective April 25. Products on which no advances were made include cold-drawn bars, spikes and bolts. No revision was made in quantity differentials or in the 10-cent per 100-pound allowance for delivery outside of Allegheny county, Pennsylvania. This week, effective with May 1, both galvanized and black wire will be advanced 15 cents per 100 pounds, nails 25 cents per keg, large rivets 25 cents per 100 pounds to $3.50. Demand for warehouse steel is considerably heavier.

Cleveland—Strikes at manufacturing plants here are interfering with warehouse business. Some consumers anticipate advances in warehouse prices as soon as the new mill prices were announced and increased their orders, so that the general volume of sales has tapered since the middle of the month. The new warehouse prices which went in effect here last week follow closely those in mill quotations, plates, shapes and bars, up $3 a ton. No. 10 blue annealed sheets, hoops and bands were raised $5 a ton. Other

products are to be advanced shortly.

Chicago—Prices on most steel products have been advanced and other changes are anticipated soon, including cold-rolled strip and galvanized and black sheets.

Boston—New schedule of higher prices following increase in mill quotations are now effective.

New York—Advances of 15 cents per 100 pounds were made effective today on most items, except that on bands and hot-rolled sheets the advance is 25 cents.

Detroit—Advances of 15 to 25 cents per 100 pounds were announced by leading warehouses here, effective April 26. Effective April 30, galvanized sheets, 24 gage, are advanced to 4.85c, and 24 gage hot-rolled annealed to 4.185c. Volume of warehouse steel shipments holds at a substantially high rate comparable with that of through March.

Cincinnati—Warehouse prices are higher, as of April 25, on bars and shapes, blue annealed sheets, bands, hoops and floor plates. Increases are expected soon on other items.

St. Louis—Movement of iron and steel from store has contracted somewhat since the first half of April, but aggregate volume is still heavy, and considerably larger than a year ago. There have been some advances, but the upturn has not extended to all items included in the recent mill increases.

Equipment

Chicago — Sales of plant machinery and equipment show the best activity among smaller items. Business in small tools has been increasing steadily so far this year and April sales are expected to exceed those of March, which for some interests were double the February volume. Orders for larger machine tools and other types of equipment show small gains but hesitancy still is apparent among leading users in making extensive commitments. Inquiries from various government forts are pending for machine tools, and other government projects continue to contribute a fair portion of inquiries and orders for various types of equipment.

Pittsburgh — Several large steel mill equipment installations, the past week in the estimating stage, promise to come forth as definite inquiries within the next week or two. In the meantime, steel mill equipment orders are relatively fewer although a Pittsburgh interest is reported to have closed on ten 2-high hand-type sheet mills for export to Japan. Recently, a valley steel mill bought two new welders for two of its pipe units. Although demand for sheet, tin plate and plate rolls is excellent, rolls of special design have not been in so active demand the past week. One leading Pittsburgh equipment builder last week announced a new type roller-leveling machine for sheets and at the same time the fact that two machines are already in operation in a midwestern steel mill.

Boston—More volume is developing in New England with an increase in wire mill equipment inquiry noted. A Worcester, Mass., wire mill recently installed two bell-type electric annealing furnaces. Inquiry from the navy department, considerable for New England delivery, is active. Several machines are also being bid for the Springfield, Mass., armory.

Metallurgical Coke

Coke Prices, Page 51

Mainly because of larger stocks foundries supplied by beehive foundry coke have been noticeably absent from the market. Connellsville oven prices on foundry coke held unchanged at $4.60. On premium grades the market is $5.35. In furnace coke, holding unchanged at $3.85, Connellsville beehive ovens, fair shipments continuing to several non-integrated blast furnaces in the Pittsburgh district but no new buying is reported.

By-product foundry coke shipments at Chicago show a slight gain so far this month compared with March. Foundry coke continues $8.50, ovens, for outside delivery and $9.25, delivered Chicago.

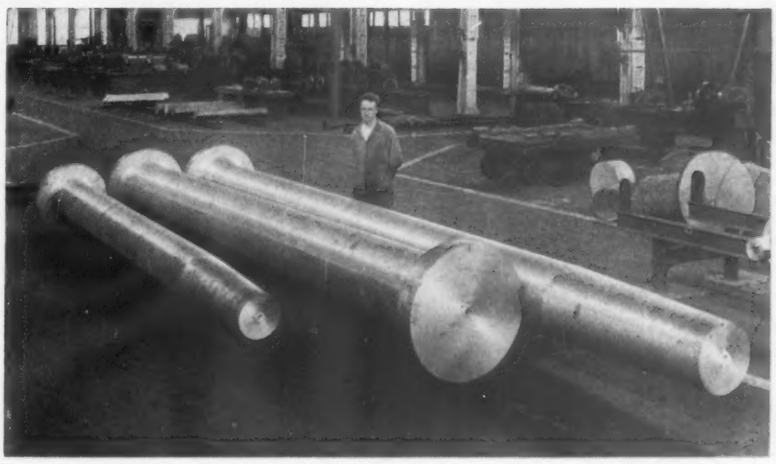
By-product coke is more active at Cincinnati. Little change in demand is apparent at St. Louis, with prices steady. Coal strikes in the south have not affected coke production at Birmingham.

Tin Plate

Tin Plate Prices, Page 50

Pittsburgh—Tin plate producing capacity still is engaged at around 80 per cent. Crop prospects are reported distinctly favorable for the canning industry. The market is unchanged

QUALITY FORGINGS



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BURNHAM, MIFFLIN CO., PENNA.

Branch Offices

New York **Philadelphia** **Chicago** **San Francisco**
Akron **Portland, O.** **St. Louis**

at $5.25 per base box, for tin plate, and 2.85c base, Pittsburgh, for tin mill sizes of black sheets.

Nonferrous Metals

Nonferrous Metal Prices, Page 52, 53

New York—Little change developed in prices on nonferrous metals last week with the exception of easiness in tin and a firmer market for zinc. Buying was light to moderate.

Copper—The industry's code went into effect Thursday. Henceforth copper produced under the code will be termed "Blue Eagle" and only this metal may be used in products for use by the government. "Non-Blue Eagle" copper sold last week as low as 8.20c compared with 8.50c for "Blue Eagle." Both buyers and sellers were proceeding cautiously pending clarification of certain sections of the code.

Lead—Prices held firm at 4.25c, New York, and 4.10c, East St. Louis, despite slower demand late in the week. April shipments increased about 4000 tons over the 30,000 tons moved in March. Sales for May shipment to date total about 17,000 tons.

Zinc—The market for prime western metal firmed up $1 a ton with the level at the close of the week 4.40c, East St. Louis. Sales were restricted although some sales of carlots and larger were reported, mostly for nearby delivery.

Tin—Prices dropped sharply with spot Straits again selling at under the 55-cent mark. Some producers in Malaya report costs as low as 11 cents per pound despite the restrictions imposed on production by the international cartel. Business here has been confined to small lots.

Antimony—Business was slow with quotations showing little change.

Aluminum — Secondary smelters now are filing prices under their code. No. 12 ranges from 14.50c to 16.00c, depending on the grade.

Silver—Bars dropped to 42.50c an ounce due to opposition of President Roosevelt to mandatory legislation but recovered to 43.00c on Friday.

Bolts, Nuts, Rivets

Bolt, Nut, Rivet Prices, Page 51

Bolt, nut and rivet specifications for April exceeded March, according to producers at Pittsburgh. The outlook for May is promising because of large prospective tonnages from car shops.

Markets are unchanged at 70 off list for bolts and nuts; $3, Pittsburgh or Cleveland, and 3.10c, Chicago, for large rivets; and 70 and 10 off for small rivets. On wrought washers, an advance from 6.25 off list is in early prospect.

Railroad demand for bolts, nuts and rivets continues to increase at Chicago and requirements of the automotive and farm implement industry are steady. Specifications from jobbers are retarded by heavy stocks.

Automobile manufacturers still are taking about 50 per cent of the nut and bolt output at Cleveland, though shipments to the Fisher Body Co. plant there were suspended last week, due to a strike. Railroad orders also are in good volume. Competition is sharp, with concessions offered by some makers.

Pacific Coast

Pacific Coast Prices, Page 51, 52, 54

San Francisco—(*By Air Mail*)—Distributors in the Los Angeles and San Francisco districts, following recent increase in mill prices, have advanced quotations from $1 to $6 a ton.

Reinforcing bar awards during the week totaled 3422 tons. W. S. Wetenhall Co. secured 575 tons for the Park street bridge in Oakland, Calif. Bids have been opened on 199 tons for Boulder dam, Boulder, Nev. Pending business exceeds 7500 tons.

For the first time this year plate awards exceed the total for the corresponding period a year ago. To date 16,454 tons have been placed, compared with 14,867 tons for the same period in 1933. Bids will be opened next week on 2500 tons for liner plates for the metropolitan water district, Los Angeles. No award has been made on 1250 tons for an 84-inch pipe line for the Santa Marie Reservoir Co., Monte Vista, Colo.

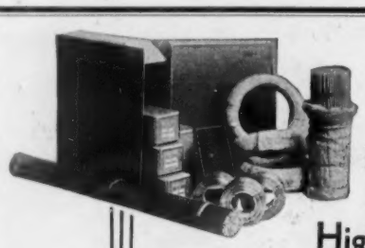
Awards of structural shapes totaled over 3400 tons. Unnamed interests booked 150 tons for four state bridges in various counties in Colorado. Bids were taken April 27 for the 393-tons Big Horn river bridge at Worland, Wyo.

Oakland, Calif., will open bids May 2 for 2157 tons of 4 to 12-inch cast pipe, and San Francisco will take bids April 30 for 765 tons of 6-inch pipe. Monterey, Calif., will open new bids April 24 for 140 tons.

Public Work Main Outlet

Seattle—Call for bids for the main Coulee dam and power houses June 18 and an upward revision of iron and steel warehouse price schedules, effective April 23, feature the market.

Tenders for the Coulee project in the Columbia river basin, Washington, will be opened by bureau of reclamation officials at the Civic building in Spokane, Wash. This unit will be only for development of power, the irrigation projects to follow.



Wire

High Carbon—Low Carbon
Oil Tempered Wire
Flat—Round and Half Round
Straightened and Cut Wire
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Sizes ½" to No. 40 W & M Gauge (.007")
All finishes
Also Screen Wire Cloth

The Seneca Wire & Mfg. Company
Established 1905
Fostoria, Ohio
Warehouses and Representatives in practically all principal cities

In line with recent mill advances on bars, plates, shapes and sheets, wholesalers have raised the prices of bars 20.00c, plates and shapes 15.00c, blue annealed sheets 10.00c and black and galvanized sheets 15.00c per 100 pounds. The new schedule has been approved by warehouses here, at Portland and in California.

The week's awards were not important but pending tonnages are of considerable proportions. United States Pipe & Foundry Co., Burlington, N. J., will supply 450 tons of 16-inch centrifugal cast iron pipe for the Juneau street improvement, Seattle. Pacific Coast Steel Co., Seattle, has an order for 100 tons of reinforcing steel for the Pioneers' Home, Sitka, Alaska.

Local plants are figuring on a quantity of reinforcing and 270 tons of steel sheet piling for the bureau of reclamation for the Coulee dam. Other business pending includes 614 tons of shapes and 235 tons of reinforcing for a state railroad subway at Pocatello, Idaho, for which North West Roads Co., Portland, Oreg., has the award. P. P. Gjarde, Seattle contractor, is low for the local university library addition, involving 200 tons of shapes and 100 tons of concrete bars. Drain, Oreg., will receive bids May 8 for furnishing three miles of 6-inch cast iron pipe.

Jobbing houses have experienced an excellent turnover this month, in some degree due to covering in anticipation of higher prices. Foundry activity is greater than for three years at this season, creating a heavier volume of pig iron and coke sales.

While exports dominate the scrap market, interest was created by the entry of the local mill of the Pacific Coast Steel Corp., which has purchased some miscellaneous scrap after being out of the market for many months. Good scrap is not offering freely. Exporters quote at $8.50 to $8.75 for No. 1 steel, cupola size, but the general opinion is that scrap is due for a rise soon.

Steel in Europe

Foreign Steel Prices, Page 54

London — (*By Radio*) — Business in steel and iron is generally quieter but its tone is healthy. Export trade is disappointing. All departments of production are busy on present contracts and one Scottish blast furnace has been restarted.

Dorman, Long & Co. Ltd. has booked two structural contracts for South Africa and Hong Kong. Westinghouse Brake & Saxby Signal Co. Ltd., London, has taken a large contract for brakes for Polish railroads. Domestic sheet and tin plate trade is improving but demand for galvanized sheets is poor.

Continental producers report export trade is generally dull.

Cold Finished

Cold Finished Prices, Page 51

While buying of cold-finished steel bars by automotive parts companies last week was somewhat lighter than early in April, demand from other classes of consumers continued good and the market situation generally continues strong. The cold-drawn carbon steel bar market is firmly at 2.10c, base, Pittsburgh. Cold-drawn alloy bars have been advanced $2 a ton to 3.05c, Pittsburgh, effective May 4.

Quicksilver

New York—Quicksilver is unchanged in a quiet market. Small lots are quoted $76, a virgin flask of 76 pounds, and round lots $75.50.

New Prices Filed With Institute

LOWEST base prices for the products mentioned, and the effective dates, filed with the American Iron and Steel institute, New York, last week include:

Effective April 28

Low phosphorus pig iron, $19.50, Johnson City, Tenn.

April 30

Manufacturing ternes, 4.30c, Pittsburgh.

May 1

Black tempered corset and boning wire, $9.00, Worcester, Mass.
Galvanized high carbon corset wire, $10.75, Worcester, Mass.
Flat or half round bobby pin wire, $11.75, Worcester, Mass.
Black tempered wood band saw steel, $23.00, Worcester, Mass., and Pittsburgh.
Butcher band saw steel, 0.65/0.85 carbon, $23.00, Worcester, Mass.
Untempered metal band saw steel, $27.00, Worcester, Mass.
Gong bell wire, 0.51/0.70 carbon, $16.75, Worcester, Mass.
High carbon, flat black tempered, heddle bar steel wire, $12.15, Worcester, Mass.
Scaleless blue heddle and drop wire steel, $17.50, Worcester, Mass.
Black tempered 0.51/0.70 carbon, knife blade steel, $11.25, Worcester, Mass.
Straight carbon spring steel lighter than 0.010-inch thick, carbon over 1.00, $58.00, Worcester, Mass.
Straight carbon spring steel lighter than 0.010-inch thick tempered, polished, colored, carbon 0.76/1.00, $46.00, Worcester, Mass.
Straight carbon spring steel lighter than 0.010-inch thick tempered, polished, colored, carbon 0.51/0.75, $36.00, Worcester, Mass.
Tempered and polished pile wire, $26.50, Worcester Mass.
Untempered, straight carbon, square blade steel, $15.50, Worcester, Mass.
Untempered scoring rule steel, $14.75, Worcester, Mass.
Tempered snap spring steel, 0.51/0.70 carbon, $16.75, Worcester, Mass.
Tempered and polished tape line steel, $31.00, Worcester, Mass.

May 3

Rolled or forged axles, 2.65c, Pittsburgh.
Cold-rolled strip steel, 2.80c, Cleveland.
Uncropped alloy ingots, $42.00, Chicago.
Alloy blooms, billets and slabs, $51.00, Massillon and Canton, O.
Ingot iron billets and slabs, $35.00, Pittsburgh, and $37.90, Cleveland.
Low carbon spring wire, 2.30c, Pittsburgh.
Bessemer or basic manufacturers' wire, 2.35c, Anderson, Ind.
Annealed fence wire, 2.50c, Anderson, Ind.
Galvanized fence wire, 2.85c, Anderson, Ind.
High carbon basic wire (equivalent to M. B.), 3.95c, Anderson, Ind.
Wire nails, 2.65c, Anderson, Ind.
Polished staples, 3.35c, Anderson, Ind.
Galvanized fence staples, 3.60c, Anderson, Ind.
Galvanized netting staples, 4.75c, Anderson, Ind.
Barbed wire, 3.05c, Anderson, Ind.
Square mesh field fence, base, specifications 9-12 inch stays, $81.25, Pacific coast ports, and $65.25, Anderson, Ind.
Poultry fence, specifications 17 C. M., $125.00, Anderson, Ind.
Hot-rolled alloy bars, 2.55c, Canton, O.
Structural shapes, 1.90c, Chicago.
Ingot iron bars, 2.15c, Pittsburgh, and 2.335c, Cleveland.
Merchant iron bars, 2.00c, Terre Haute, Ind.
Open-hearth basic pig iron, $17.00, Provo, Utah.
Refined iron bars, 2.25c, Terre Haute, Ind.
Hot rolled annealed, ingot iron, tin mill black sheets, 3.25c, Pittsburgh, and 3.59c, Gary, Ind.
Carbon steel blooms, billets and slabs, forging quality, $34.00, Cleveland.

May 4

Square mesh field fence, base, specifications 9-12 inch stays, $64.25, Pittsburgh.
Poultry fence, base, specifications No. 17, $121.00, Pittsburgh.
Polished fence staples, 3.30c, Pittsburgh.
Galvanized fence staples, 3.55c, Pittsburgh.
Galvanized netting staples, 4.70c, Pittsburgh.
Barbed wire, 3.00c, Pittsburgh.
Hot-rolled pickled in the breakdown, annealed, deoxidized sheets, 3.05c for No. 24 gage, and 2.35c for No. 10 gage, Pittsburgh.
Hot-rolled sheets, 2.00c for No. 10 gage, Pittsburgh.
Cold-rolled sheets, 3.15c for No. 20 gage, Pittsburgh.
Rail steel merchant bars, 1.95c, Birmingham, Ala., and 2.20c, Gulf ports.

New billet steel merchant bars, 2.05c, Birmingham, Ala.

May 4

Tinned and/or lacquered edging strip steel, $11.62½, Worcester, Mass.
Uncropped, rerolling quality, carbon steel ingots, $29.00, Pittsburgh.
Special analysis die block steel, $51.00, Massillon, O.
Cold-finished alloy bars, 3.05c, Gary, Ind.
Alloy steel bar sized angles, channels, tees and zees, 3.00c, Massillon and Canton, O.; Chicago; Buffalo.
Electric furnace plain carbon steel, general requirement grade, but not including tool steel grade. Carbon up to 0.50 inclusive; bars, 3.05c, billets, $61.00. Carbon 0.51 to 0.80 inclusive; bars, 3.30c, billets, $66.00. Carbon 0.81 to 1.05 inclusive; bars, 3.55c, billets, $71.00. Electric furnace SAE, 1095 spring steel rounds; bars, 3.05c, Massillon, O.

May 5

Hot rolled wire rods, $39.00, Chicago.
Square mesh field fence, base, spec. 9-12-inch stays, $73.25, Houston and Galveston, Tex., and $66.25, Chicago.
Poultry fence, base, spec. No. 17, $130.00, Houston and Galveston, Tex., and $138.00, Pacific coast ports.
Single loop bale ties, $64.00, Chicago, and $72.00, Houston and Galveston, Tex.
Polished fence staples, 3.35c, Chicago.
Galvanized fence staples, 3.60c, Chicago.
Galvanized netting staples, 4.75c, Chicago.
Barbed wire, 3.05c, Chicago.
Flat galvanized, pure iron culvert sheets, 3.54c for No. 16 gage, Pittsburgh.
Flat galvanized, copper bearing, pure iron culvert sheets, 3.49c for No. 16 gage, Pittsburgh.
Flat galvanized, copper iron culvert sheets, 3.49c for No. 16 gage, Pittsburgh.
Armco Ingot iron enameling sheets, 3.35c for No. 10 gage, and 3.80c for No. 20 gage, Pacific coast ports.
Hot-rolled alloy steel bars, 2.55c, Pittsburgh and Chicago.
Hot-rolled strip (billet steel), 2.10c, Chicago.

May 8

Butcher band saw steel, 0.65/0.85 carbon, $23.00, Pittsburgh.
Untempered metal band saw steel, $27.00, Pittsburgh.

Here and There In Industry

Two advertisements of a series run by the Climax Molybdenum Co., New York, recently in STEEL and prepared by N. W. Ayer & Son, Philadelphia, were awarded honors at the thirteenth annual exhibition of the Art Directors' club, being held in the RCA building, New York, until May 12. The advertisements, prepared by Alexey Brodovitch, artist, and Nelson Gruppo, art director, were "air brush art."

□ □ □

Hanna Furnace Corp., Buffalo, moved its New York offices from 30 Church street to 500 Fifth avenue, fifty-first floor, April 30. C. R. Wells is district manager.

Construction and Enterprise

New England

BOSTON—Old Medford Rum Distillery, 83 Newbury street, plans additions and alterations to its distillery on Hall street from plans by Leon Hysen, care owner.

ROCKPORT, MASS.—George H. Todd Corp. has been formed by George H. Todd and F. K. Perkins, 3 Dexter place, Gloucester, Mass., to manufacture oil-burning equipment.

TAUNTON, MASS.—Albert Chapman has bought the plant of the Bay State Tap & Die Co., Grosvenor street, and will remodel it for production of automotive parts and for a machine and repair shop.

EAST PROVIDENCE, R. I.—Johnson Tool Co. Inc. has been formed by Andrew E. Johnson, 36 Barnsdale road, to manufacture tools and equipment.

PAWTUCKET, R. I.—Rhode Island Strip Steel Co., Phillipsdale, R. I., has awarded contract to H. M. Soule, 110 Brook street, Pawtucket, R. I., for addition 30 x 120 feet, to cost about $25,000. (Noted April 9.)

New York

BROOKLYN, N. Y.—Signal supply officer, army base, will receive bids May 7 for two gasoline-engine driven power units with generators.

LOCKPORT, N. Y.—City council has bid in at public sale plant of former Covert Gear & Mfg. Co., Lock and Grand streets, and will offer it for sale to regain unpaid taxes of several years.

NEW YORK—Raritan Petroleum Corp., care Louis H. Bean, 60 East Forty-second street, plans to remodel its refinery at Greensands, near New Brunswick, N. J., at cost of about $28,000.

NEW YORK—Ross Brass Works Inc. has been formed by Robert Ross, 1450 Broadway, to take over a business under the same name at 403 East Ninety-first street, manufacturing brass plumbing supplies.

NIAGARA FALLS, N. Y.—A plant on Highland avenue has been leased by the American subsidiary of the Treibach Chemical Works of Austria and will be equipped with machinery for the production of metallic cerium and other products in the rare metals field. Charles Ganz, 150 East Ninety-third street, New York, is president of the American corporation.

New Jersey

NEWARK, N. J.—Cap Screw & Nut Co. of America Inc., 79 Polk street, Newark, N. J., has leased an entire floor at 32-36 Green street, Newark. (Noted April 16. Note correction of address.)

NEWARK, N. J.—Federal Couch & Steel Products Co. has been incorporated with capital of $50,000 to deal in metal products. Seymour J. Solomon is agent.

VINELAND, N. J.—Braverman Electric Co. Inc. has been formed by Fred Braverman and associates, 643 Landis avenue, to manufacture electrical equipment and supplies.

Ohio

DAYTON, O.—Electrodes Inc. has been formed by Fred L. Damarin and C. J. Stoecklein, 720 Reibold building, to manufacture electrodes and other welding supplies.

SANDUSKY, O.—Vulcan Mfg. Co., Kansas City, Mo., manufacturer of the Faultless washing machine, has taken over the plant of the old Erie Tire & Rubber Co., which it will remodel for the manufacture of its product. Its equipment will be removed from the Kansas City plant and production is expected to be under way by Sept. 1. S. S. Holland is president, and G. R. Traughber is superintendent. Sandusky Industrial Foundation was active in promoting the move.

TOLEDO, O.—Toledo Wire & Iron Co. Inc. has been formed by Robert C. Dunn to take over the business of the Toledo Wire & Iron Co., 1200 Locust street, and manufacture wire and iron products.

Michigan

DETROIT—Cross Gear & Machine Co. has been incorporated with capital of $10,000 to do general manufacturing business, by Ralph E. Cross, 3250 Bellevue avenue.

FLINT, MICH.—E. Kelly, AC Spark Plug Co., Flint, Mich., is taking estimates on a $60,000 factory addition to be erected for the company on Dort Highway, Flint, Mich.

Indiana

LAWRENCEBURG, IND. — James Walsh & Co. has let contract to Hillsmith & Co., 108 East Third street, Dayton, O., for construction of a distillery to cost about $500,000.

TELL CITY, IND.—Kroghman Distilling Co. has let general contract for a 3-story distillery to J. D. Jennings, 443 Garden street, Louisville, Ky. Cost will be about $100,000.

Illinois

ALEDO, ILL.—City plans construction of an artificial gas plant and distributing system to cost $98,000. J. A. McBride, 2639 Locust street, St. Louis, is engineer.

CHICAGO—Chicago Automotive Maintenance Inc., 1818 Lawrence avenue, has been incorporated to maintain a factory and machine shop for the manufacture of machinery, engines, and motors, by Harry J. Walker, Anthony H. Bennett and Andrew B. Douglass. Correspondent: Harry J. Walker, 1818 Lawrence avenue.

District of Columbia

WASHINGTON—Veterans adminis-

tration, L. H. Tripp, director of construction, 764 Arlington building, will open bids May 22 for ash removal system, veterans facility, Minneapolis, Minn.

WASHINGTON — Department of justice, bureau of prisons, will receive bids May 9 for addition to boiler room and alterations to heating and plumbing systems at the United States detention farm, Milan, Mich.

WASHINGTON — Treasury department, procurement division, public works branch, will take bids May 9 for metal partitions and steel shelving for department of labor and interstate commerce buildings and connecting wing.

WASHINGTON—Bureau of supplies and accounts, navy department, will open bids May 1, schedule 2280, one crawler or track-type tractor, delivery Washington; schedule 2290, one motor-driven coper and notcher, punch, combination shear machine, delivery Charleston, S. C.; May 4, schedule 2286, 24 pairs electrically heated and operated sanders, delivery, Brooklyn, N. Y.; schedule 2292, one electric furnace; schedule 2334, six electric arc welding sets, delivery Brooklyn, N. Y., and Charleston, S. C. May 8, schedule 2350, one orange peel digging bucket, delivery New York or Philadelphia; schedule 2356, two precision jig boring machines, delivery Washington; schedule 2378, two motor-driven, portable, oxy-acetylene cutting machines, delivery Charleston, S. C.

Alabama

BIRMINGHAM, ALA.—Ingalls Iron Works Co. is enlarging its tank manufacturing plant at North Birmingham by removal of machinery from its main fabricating plant here.

Georgia

SAVANNAH, GA.—Rourke's Iron Works has been incorporated with capital of $100,000 by Arthur L. Rourke and James A. Rourke Jr., 545 East Bay street.

Kentucky

LOUISVILLE, KY.—Motor Machine Co. has been incorporated by Raymond Reynolds and G. Reynolds.

LOUISVILLE, KY. — Stitzel-Weller Distillery has been incorporated with $200,000 capital by A. P. Stitzel, Shelbyville road, and A. T. Farnsley.

MAYSVILLE, KY.—Maysville Water Co. Inc., T. A. Duke, president, will open bids in about a month for a $50,000 waterworks, including filtration plant and storage tank. J. E. Sirrine & Co., Greenville, S. C., is engineer.

Maryland

BALTIMORE—Dalmar Corp., Woodberry, Md., subsidiary of Franklin Railway & Supply Co., 60 East Forty-second street, New York, will operate plant No. 1 of Poole Engineering & Machine Co., Woodberry. Philip L. Poe and Howard S. Jones, Union avenue and Clipper road, will operate plant No. 2 at Union and Vista avenues.

OWINGS MILLS, MD. — Owings Mills Distillery Inc., J. J. Landsburgh, president, will install a grain dryer and large metal tanks in its plant now under construction.

North Carolina

HUDSON, N. C.—Caldwell Cotton Mill Co., B. B. Hayes, superintendent, is planning to install spinning frames and carding machines, replacing present equipment.

WAYNESVILLE, N. C. — Western North Carolina Creamery, W. R. Woodall, manager, is planning to construct a creamery 40 x 70 feet, to cost about $25,000, including new machinery.

South Carolina

BLACKVILLE, S. C.—City has been allotted $45,000 for waterworks.

GREENVILLE, S. C. — Greenville Textile Machinery Co. has permit for $10,000 improvements to plant at Vardry court.

CHARLESTON, S. C.—The machine tool modernization program planned for the Charleston navy yard includes installation of a high pressure test boiler in the machine shop and a flanging machine in the pipe shop.

MOUNT PLEASANT, S. C.—Town, William L. Erckmann, mayor, has loan and grant of $75,000 for water works, including 300,000-gallon reservoir, and will install electrical pumps equipped with gasoline auxiliaries for emergency use.

Tennessee

CHATTANOOGA, TENN. — Lucey Boiler & Mfg. Co. has been incorporated with capital of $25,000.

MEMPHIS, TENN.—St. Louis & San Francisco will make improvements at its Yale yards, including crane track and drive 100 feet long.

KNOXVILLE, TENN. — Tennessee Valley authority, C. H. Garity, director of purchases, will receive bids May 1 for material handling equipment, and bids May 2 on monorail conveyor.

KNOXVILLE, TENN. — Tennessee Valley authority, C. H. Garity, director of purchases, will take bids May 11 for furnishing and erecting new material handling and conveying equipment for existing buildings at fertilizer works, nitrate plant No. 2, Sheffield, Ala.

MEMPHIS, TENN.—Southern Har-

GOOD USED EQUIPMENT

For

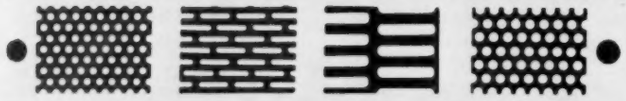
DIE CASTING
FORGING INDUSTRY
MACHINE SHOPS
POWER PLANTS
ROLLING MILLS
STAMPING and ALLIED INDUSTRIES
STRUCTURAL, BOILER and TANK INDUSTRY

AIR COMPRESSORS—(2) G. E. dir. conn. Centrifugal, 8000 and 5400 cu. ft., 1.5 lb. pressure, AC motors and starters.
BENDING ROLLS—25' 6" NILES-BEMENT-POND Plate. Pyr. Type. Arr. for MD. Top roll 24-7/8" dia. Bottom rolls 18" dia. Cap. 1" plate. Drop end housing.
10' 2" MARSHALLTOWN Plate. Pyr. Type. Arr. for AC MD. Top roll 8-1/4" dia. Bottom rolls 7" dia. Drop end housing. Cap. 1/4" plate.
BRAKE—12' 6" LOY & NAWRATH Power Press. Cap. 1/4". Arr. for AC MD.
CRANE—5-T. SHEPARD Overhead Electric Traveling, 52' 4" span, 230 v. DC. Also equipped for bucket & magnet operation. 350 feet of Double "A" Frame Runway.
FORGING MACHINE—2" AJAX New Model, Steel Frame.
HEADER—No. 2 O.D.T.S. WATERBURY FARREL Open Die, Triple Stroke. Cap. 1/4" to 3/8" dia. wire. BD. Like new.
MAGNET—45" ELECTRIC CONTROLLER MFG. CO., 230 V. DC.
PRESS—No. 6-1/2 BLISS Straight Side, Double Crank with spring counterbalance. Belt drive. 54" bet. housings. 8" stroke.
OTHER MECHANICAL AND HYDRAULIC PRESSES FOR A WIDE VARIETY OF TYPES AND CAPACITIES OF WORK.
ROLLING MILL—Rolls 24" wide by 12" dia. and equipped with a 22 HP, 220 v. 3 ph. 60 cy. AC motor, with starter and switch box.
SHEARS—62" STAMCO Gate. Capacity 1/2" plate. 18" gap. Driven by a 20 HP, 3 ph. 60 cy. AC motor. Power actuated hold-down clamp. Modern machine. Practically new.
No. 10 BUFFALO for bars and shapes. Capacity up to 3-7/8" rounds and corresponding duty in shapes. Direct connected AC MD with motor.
SHAPER—32" COLUMBIA High Duty. Quick Change Speedbox. Arr. for direct connected constant speed motor drive.
WELDERS—Arc. LINCOLN, 220-440 v., 3 ph. 60 cy., Portable. Complete with controls, meters, tools.

In addition to the above, we have available a wide variety of good equipment in various types and sizes.

Manufacturing RITTERBUSH & COMPANY, INC. Equipment
30 CHURCH ST.
NEW YORK CITY

SCREENS of Perforated Metal



The Harrington & King PERFORATING Co.

5634 Fillmore St., Chicago, Ill.
New York Office—114 Liberty St.

HANNA PIG IRON

BRANDS:
Buffalo—Detroit—Susquehanna
GRADES:
Foundry—Malleable
Silvery—Ferro-Silicon

The HANNA FURNACE CORP.
MERCHANT PIG IRON DIVISION
OF NATIONAL STEEL CORP.
Buffalo, New York Detroit, Mich.
New York Philadelphia Boston

High Grade STRIP STEEL

Stamping and Deep Drawing—Uniform in Quality

Control of the quality begins with the manufacture of the steel in our own Open Hearth and continues through all subsequent processes.

LACLEDE STEEL CO., ST. LOUIS
STEEL WORKS & ROLLING MILLS, ALTON and MADISON, ILL.
OFFICES: Detroit—Chicago—St. Louis—Kansas City

CERTIFIED
MALLEABLE IRON CASTINGS

Detachable Sprocket Chain
Riveted Sprocket Chain
Malleable Washers, etc.

PEORIA MALLEABLE CASTINGS CO.
FT. ALEXANDER ST. PEORIA, ILLINOIS

BELMONT IRON WORKS
PHILADELPHIA NEW YORK EDDYSTONE
Engineers - Contractors - Exporters
STRUCTURAL STEEL — BUILDINGS & BRIDGES
RIVETED — ARC WELDED
BELMONT INTERLOCKING CHANNEL FLOOR
Write for Catalogue
Main Office—Phila, Pa. New York Office—44 Whitehall St.

SMALL ELECTRIC STEEL CASTINGS

(Capacity 500 Tons per Month)

WEST STEEL CASTING CO.
CLEVELAND OHIO, U. S. A.
"He Profits Most Who Serves Best" *Better Steel Castings*

HIGH SPEED AND CARBON TOOL STEEL QUALITY UNEXCELLED

LATROBE ELECTRIC STEEL CO.
LATROBE PA.

SAMSON STEEL SHOT
ANGULAR STEEL GRIT

Reg. U.S. Pat. Off.

MANUFACTURED ONLY BY:
PITTSBURGH CRUSHED STEEL CO.,
PITTSBURGH, PA.
STEEL SHOT & GRIT CO.,
AMESBURY, MASS.

SC&H Furnaces are made for annealing, case hardening, carburizing, forging, cyaniding, lead hardening & oil tempering.

STRONG CARLISLE & HAMMOND

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THOMAS

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vester Co. Inc., with authorized capital of $1,000,000, has building on Bodley street near South Lauderdale, where Rust Bros. cotton picking machine will be partially manufactured and assembled. John D. Rust is president and general manager.

Virginia

AMHERST, VA.—Town, O. L. Evans, mayor, votes May 17 on issuance of $250,000 bonds for water supply.

Missouri

KANSAS CITY, MO.—City, through M. S. Murray, director of public works, plans construction of a municipal gas plant and distributing system. PWA loan of $10,130,000 is being sought.

KANSAS CITY, MO.—Randolph Dock Co., care of Heidenreich Engineering Co., Railway Exchange building, consulting engineer, is planning new dock and will install grain elevator, conveying, screening and other mechanical handling equipment.

PARIS, MO.—City, R. B. Sproul, clerk, is planning water main extension and erection of storage tank of 110,000-gallon capacity, and tower. W. B. Rollins & Co., Railway Exchange building, Kansas City, Mo., are engineers.

ST. LOUIS—McKnab Oil & Gas Co., Winfield, Kans., has submitted proposal to board of aldermen to furnish natural gas to city for distribution and to build pipe line from Bowling Green to St. Louis at a cost of $1,800,000.

Oklahoma

PAWNEE, OKLA.—City has voted $48,000 bonds for constructing light plant.

Texas

HOUSTON, TEX.—Minerals Corp. of Texas has been incorporated by E. W. Stapleton and J. P. Markham Jr., Second National Bank building.

NORMANGEE, TEX.—City, C. E. Peters, city secretary, is planning waterworks to cost $32,000. Culpepper-Flag, Houston, Tex., are engineers.

Wisconsin

FENNIMORE, WIS.—A $40,000 bond issue to start work on $103,000 sewerage system and disposal plant has been adopted. Frank J. Davy, courthouse, LaCrosse, Wis., is consulting engineer.

MILWAUKEE—City sewerage commission has awarded contract to Hoffmann Combustion Engineering Co., 410 Ford building, Detroit, to furnish replacement stoker on one 800-horsepower boiler at sewage disposal plant at $14,408, and option on three additional units at $43,324.

RACINE, WIS. — Machinery and equipment of Ajax Rubber Co. Inc., Racine, Wis., will be sold at auction May 16 and 17, including manufacturing and industrial buildings, tire and rubber machinery and equipment, machine shop equipment and power equipment, by Samuel T. Freeman & Co., 27 William street, New York, auctioneers.

SHEBOYGAN, WIS. — Construction of new $300,000 vocational school has been indefinitely postponed following adverse vote on borrowing plan at special election.

THORP, WIS.—G. A. Krasin, Marshfield, Wis., architect, will take bids soon on equipment for new brewery here to be remodeled from existing building at cost of $50,000.

Minnesota

MINNEAPOLIS — Gluek Brewing Co., 2021 Marshall street Northeast, Louis G. Gluek, president, has awarded contract to Madsen & Simonsen, 2817 Lyndale avenue South, for an addition to its brewery, including a second story addition to the wash house 40 x 100 feet, and will install new keg hoist and washing equipment. Stebbins, Haxby & Bissell, 1111 Nicollet avenue, are architects.

Iowa

DUBUQUE, IOWA—Webster Mfg. Co., subsidiary of Webster Lumber Co., 2522 Como avenue West, St. Paul, Minn., Richard Westerly, superintendent, is building a 2-story, 60 x 40 foot factory for manufacturing barrel staves, including five electric motors and timber conveyor. Complete equipment for a cooperage plant will be installed later.

WATERLOO, IOWA—B. F. Lichty and his sons will establish the Lichty Metal & Heating Co. at 818 Sycamore street to engage in the manufacture and installation of air conditioning equipment, warm air heating and sheet metal work.

WAVERLY, IOWA—Marshall Canning Co. will install a large boiler in its plant soon to provide power and steam for packing tomatoes.

Montana

FORT PECK, MONT. — Ziebarth-Walker Co., Long Beach, Calif., has formal award to construct a 287-mile electric transmission line from Great Falls, Mont., to this point on a bid of $1,070,499.

Pacific Coast

LOS ANGELES—Balboa Brewing Co. is asking permission to convert a cotton mill building into a brewery plant at 1834 North Main street at a cost of approximately $15,000.

LOS ANGELES—Board of education is having plans drawn by several architects for shop buildings for various high schools, as follows: By Donald B. Parkinson, 808 Title Insurance building, for manual arts high school, entire cost about $942,000; by R. C. Beanfield, 616 Chamber of Commerce building, for John Burroughs high school, total cost $217,000; by C. J. Derrick, 2021 Kenilworth avenue, for Nirgil junior high school, about $12,000; by John C. Austin and F. M. Ashley, Chamber of Commerce building, for Venice high school, about $169,000.

SAN FRANCISCO—Shell Oil Co., Shell Oil building, is having plans prepared by its engineering department for an alcohol plant at Martinez, Calif.

SAN JOSE, CALIF.—Continental Can Co.'s new $300,000 plant is nearing completion here at Eighth and Taylor streets and will be ready for operation in June.

SANTA MONICA, CALIF.—L. B. Norman, 1034 Seventeenth street, has been awarded a contract for an addition 125 x 297 feet for Douglas Aircraft Co., to cost about $30,000. Ellis Wing Taylor, 803 West Third street, Los Angeles, is architect.

ELLENSBURGH, WASH.—Milk Products Co. has purchased a site and is planning erection of a concrete plant, 100 x 120 feet, for manufacture of dairy products.

OLYMPIA, WASH.—E. N. Hutchinson, secretary of state and secretary of state parks commission, announces the latter body will consider types of electric generator plants and water supply systems for furnishing, cooling and refrigerating the 100-man relief camp established at Dry Falls, near Coulee, Wash.

PORT ANGELES, WASH.—Bids will be opened at Washington, May 11, for construction of coast guard hangar here, 100 x 120 feet, of steel frame on concrete foundation.

PULLMAN, WASH. — Regents of Washington state college will receive bids May 15 for construction of concrete 4-story, fireproof chemistry hall, 81 x 182 feet.

SEATTLE—Rainier Brewing Co. is planning to spend $500,000 in rebuilding and modernizing its local plant.

SPOKANE, WASH.—Spokane Brewing & Malting Co. is planning a 3-story addition to cost $30,000, including new equipment, which will have a monthly capacity of 7000 barrels.

Dominion of Canada

VANCOUVER, B. C.—H. A. Flood, Tacoma, Wash., and associates, plan central heating plant here, first unit to cost $250,000, to supply downtown area.

FERGUS, ONT.—Beatty Bros. Ltd. will manufacture in its local plant the line of windmills, hand and power pumps, and grain grinders formerly made by the Gould, Shapley & Muir Co., Brantford, Ont., which is retiring from business.

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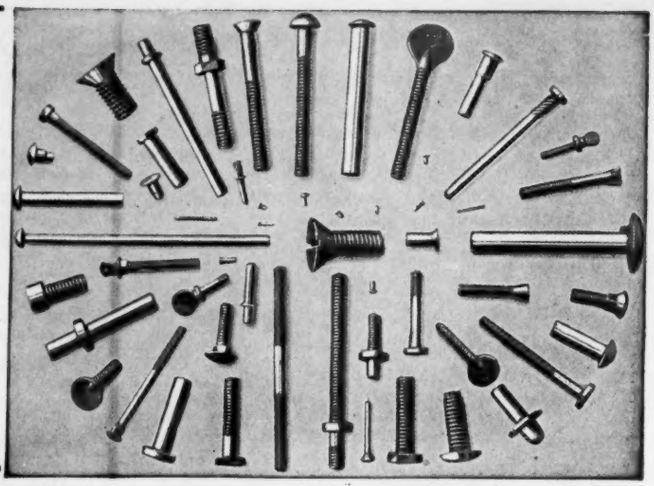

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Bids Wanted

TREASURY DEPARTMENT, PROCUREMENT DIVISION, Public Works Branch, Washington, D.C.—Sealed bids in duplicate will be publicly opened in this office at 3 p.m., May 10, 1934, for furnishing all labor and materials and performing all work for construction of the U. S. post office at Berea, Ohio. Attention is directed to the special conditions of bidding set forth in the specifications and bulletin No. 51 of the Federal Emergency Administration of Public Works and Executive Order No. 6646 dated March 14, 1934. Drawings and specifications not exceeding 3 sets may be obtained at this office in the discretion of the assistant director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. REYNOLDS, Assistant Director of Procurement, Public Works Branch.

Bids Wanted

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed bids in duplicate, will be publicly opened in this office at 3 p.m., May 8, 1934, for furnishing all labor and materials and performing all work for construction of the U. S. post office at Hancock, Mich. Attention is directed to the special conditions of bidding set forth in the specifications bulletin No. 51 of the Federal Emergency Administration of Public Works and to Executive Order No. 6646. Drawings and specifications not exceeding 3 sets may be obtained at this office in the discretion of the assistant director of Procurement, Public Works Branch, by any general contractor provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested and to quantity surveyors provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the United States. Cash deposits will not be accepted. W. E. REYNOLDS, Assistant Director of Procurement, Public Works Branch.

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